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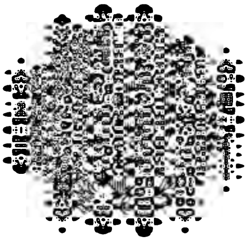

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DESCRIPTION AND STRENGTH

OF SOME OF THE

INDIAN AND BURMAN

TIMBERS.

BY

CONDUCTOR T. W. SKINNER,

GUN CARRIAGE MANUFACTORY

MADRAS:
PRINTED BY H. SMITH, AT THE FORT SAINT GEORGE GAZETTE PRESS.
1862.

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The
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PREFACE.

SINCE the great Exhibition of London in 1851, and that of Madras in 1857, there have been several reports published on the TIMBERS OF INDIA AND BURMAH, which have afforded much valuable information on many points; but they are still wanting in respect to the nature and strength of the different woods—a subject, which is of much importance to the Engineer and practical man, and which has engaged the attention of some of the most eminent Mathematicians and Engineers of Europe for the last two centuries.

I felt reluctant at first to carry out the experiments from the idea that they should be undertaken by persons more competent than myself; but I was encouraged to do it by Colonel MAITLAND, whose object it has been, since he assumed charge of the Department, to diffuse as much general knowledge among his Subordinates as will tend to the advantage of the State and their own efficiency; giving me every assistance, and allowing me to have access to his Library for books of reference.

I have also to acknowledge the valuable assistance afforded me by Mr. G. SHANNON, the Draughtsman, for the execution of the *Plates* in the volume.

In calculating the strength and stress of the different woods, I consulted BARLOW'S "*Strength and Stress of Timber,*" and TREDGOLD'S "*Elementary principles of Carpentry;*" and I have adopted the latter author's form, from being more simple and concise in the operation.

For the description of the different trees, I consulted VOIGT'S "*Hortus Suburbanus Calcuttensis,*" and Major H. DRURY'S "*Useful plants of India.*" I have borrowed largely from the latter author, the description of such trees as I have not seen, and I have followed his method of arranging the Botanical names alphabetically, as being more convenient for reference. I consulted the same author for the Synonyms—also Dr. E. BALFOUR'S work on the "*Timber trees, &c., of India, and of Eastern and Southern Asia,*" and Dr. BRANDIS' "*List of Burman woods,*" lately published.

W. T. S.

PRINCIPAL ABBREVIATIONS EMPLOYED IN THIS VOLUME.

Bl	Blume, (C. L.) Flora Javanensis.
Buch	Dr. Francis Hamilton, formerly Buchanan, whose "Journey" MSS., and Herbarium, are well known among Botanists.
Choisy	A Swiss botanist, who elaborated several of the Natural Orders for DeCandolle's Prodromus.
Cor	Correa, (F.) de Serra, a Botanical writer.
D. C.	DeCandolle, (A. P.) Prodromus Systematis Naturalis Regni Vegetablis.
Don, (G.)	Editor of a new Edition of Miller's (Gardener's) Dictionary, 4 vols. 4to.
Dun	Dunal, (Mich. Felix.)
Goert	Gœrtner, (J.) de fructibus et seminibus plantarum, 2 volumes 4to.
Grah	Graham's (J.) Catalogue of Bombay Plants.
H.B. and Kth.	Humboldt, Bonpland and Kunth, authors of Nova genera et species plantarum æquinoctialium orbis novi.
Heyne	Herbarium Madraspatense, formed by Drs. Klein, Heyne, and Rottler.
Jacq	Jacquini icones plantarum rariorum, 3 volumes 1781.
Juss	Jussieu, (Adrian de) A celebrated Botanist.
Kœn	Kœnig, a Danish Botanist, Physician to the Tranquebar Mission in 1768.
Lam	Lamarack, (J. B.) Editor to the botanical portion of the Encyclopœdia Methodique *(Enc. Meth.)* Paris 1783.
Linn	Linnæus. The founder of Botanical Science. His principal works are Species plantarium *(Linn. Sp.)* Mantissa plantarum *(Linn. Mant.)* Flora Zeylanica *(Fl. Zeyl.)* His son published a supplementum plantarum.
Lour	Loureiro, Flora Cochinchiensis, 1 volume 1790.

Pers	Persoon, *(C. H.)* Synopsis plantarum.
R. Br	Robert Brown. The most famous of English Botanists.
Retz	Observationes botanicæ, 1774.
Rheede	Author of the Hortus Malabaricus, 12 volumes folio, 1686—1703.
Roth	(A. W.) Author of Nova plantarum species præsertim Indiæ orientalis.
Rottl	Rottler, (Dr.) An Indian Botanist for a long time residing at Tranquebar.
Rox	Roxburgh, (Dr. W.) One of the most indefatigable of Indian Botanists. His principal works are Flora Indica *(Fl. Ind.)*, 3 volumes. An edition was published by Carey and N. Wallich at Serampore *(ed. Car.)* Plants of the Coromandel Coast, *(Cor.)* Hortus Benghalensis. He left behind him also drawings of plants in the East India Company's Museum, *(E. I. C. Murs.)*
Rumph	Rumphu Herbarium Amboinense.
Schott	A traveller in Brazil.
Schult	Schultes (J. A.) and Roemur, (J. J.) authors of Linnæi systema vegetabilium.
Spreng	Sprengel (Professor) Systema Vegatabilium.
Thumb	Thumberg, (C. P.) Flora Japonica.
Vahl	Vahl, (M.) Symbolæ botanicæ. Enumeratio plantarum.
Vent	Ventenant, (S. P.) A famous French Botanist.
Wall	Wallich, (N.) Plantæ Asiaticæ rariores. Tentamen Floræ Nepalensis.
Wht	Wight's and Arnott's Prodromus Floræ Peninsulæ Indiæ orientalis.
Willd	Willdenow, (C. L.) Linnæi species plantarum.

ABBREVIATIONS EMPLOYED IN THE SYNONYMS.

BEN.	Bengalese.
BUR.	Burmese.
CAN.	Canarese.
CYN.	Cyngalese.
DUK.	Dukanee.
ENG.	English.
HIND.	Hindoostanee.
KAR.	Karen.
MAH.	Mahrattah.
MAL.	Malyalim.
MAY.	Malays.
TAL.	Taliem.
TAM.	Tamil.
TEL.	Teloogoo.

INDEX OF LATIN SYNONYMS.

No.

ACACIA amara ... 1
„ Arabica ... 2
„ chundra ... 11
„ elata ... 3
„ ferruginea ... 4
„ leuchophlæa ... 5
„ lomatacorpa ... 6
„ odoratissima ... 6
„ serissa ... 7
„ speciosa ... 7
„ species ... 8
„ stipulata ... 9
„ suma ... 10
„ sundra ... 11
„ xylocarpa ... 83
Adambea glabra ... 87
Adenanthera aculca ... 108
„ pavonia ... 12
Alangium hexapetalum ... 13
Andersonia acuminata ... 50
„ altissima ... 51
„ lanceolata ... 50
Anogeissus acuminatus ... 50
„ latifolius ... 51
Anona reticulata ... 14
Artocarpus echinatus ... 15
„ heterophylla ... 17
„ hirsuta ... 16
„ integrifolia ... 17
Averrhoa curambola ... 18
Azedarachta Indica ... 19

BALANOPTERIS minor ... 79
Barringtonia acutangula ... 20
„ racemosa ... 21
Bassia latifolia ... 22
„ longifolia ... 23
Bauhinia coromandelina ... 24
„ purpuria ... 24
Berrya ammonilla ... 28
Bignonia chelonoides ... 25
„ longifolia ... 25
„ stipulata ... 26
„ suberosa ... 27
Bombax pentandrum ... 67
Borassus flabelliformus ... 30
Bridelia spinosa ... 29
Bubroma guazuma ... 77
„ tomentosum ... 77
Byttneriæ species ... 31

No.

CÆSALPINA coriaria ... 32
„ sappan ... 33
Calophyllum apetalum ... 36
„ Burmanni ... 34
„ calaba ... 36
„ calaboides ... 36
„ longifolium ... 35
„ spurium ... 36
Carallia integrima ... 37
„ integrifolia ... 37
„ lucida ... 37
Careya arborea ... 38
Cassia fistula ... 43
„ florida ... 39
„ marginata ... 44
„ sumatrana ... 39
Castanea Indica ... 40
„ Martabanica ... 41
Casuarina equisetifolia ... 42
„ muricata ... 42
Cathartocarpus emarginatus ... 44
„ fistula ... 43
„ rhombifolia ... 43
„ Roxburghii ... 44
Cedrela hexandra ... 45
„ toona ... 45
Ceiba pentandra ... 67
Cephalanthus pilulifer ... 100
Chickrassia tabularis ... 46
Chloroxylon swietenia ... 47
Citrus aurantium ... 48
„ nobilis ... 48
Cluytia spinosa ... 29
Cocus nucifera ... 49
Colbertia coromandelina ... 57
Conocarpus acuminata ... 50
„ latifolia ... 51
Cratæva vallanga ... 74
Cynometra cauliflora ... 52
„ ramiflora ... 52

DALBERGIA arborea ... 53-107
„ frondosa ... 53
„ latifolia ... 54
, paniculata ... 55
„ sissoo ... 56
Dillinea Indica ... 58
„ pentagyna ... 57
„ scabrella ... 59
„ speciosa ... 58

No.

Diospyros cordifolia ... 60
„ hirsuta ... 61
„ melanoxylon ... 62
Dipterocarpus elatus ... 63
„ turbinatus ... 64
Dolichos arborea ... 107

ELATE sylvestris ... 104
Elæodendron Roxburghii ... 65
„ glaucum ... 65
Emblica officinalis ... 105
Epicarpus orientalis ... 66
Eriodendron anfractuosum ... 67
Eucalyptus piperita ... 68
Eugenia acutangula ... 20
„ jambolana ... 120
„ racemosa ... 20-21
Euphorbia tirucalli ... 69

FERONIA eliphantum ... 74
Ferreola buxifolia ... 89
Ficus Bengalensis ... 70
„ Indica ... 70
„ racemosa ... 71
„ religiosa ... 72
„ tsiela ... 73
Flos reginæ ... 87

GALEDUPA Indica ... 107
Gossampinus rumphii ... 67
Grewia tiliæfolia ... 75
Guatteria longifolia ... 76
Guazuma tomentosum ... 77
„ ulmifolia ... 77

HARDWICKIA binata ... 78
Heritiera minor ... 79
Hibiscus populneus ... 130
Hopea odorata ... 80

INGA dulcis ... 82
„ species ... 81
„ xylocarpa ... 83
Ixora parviflora ... 84
„ alba ... 84
„ decipiens ... 84

JUGLANS cattapa ... 125

LAGERSTRŒMIA microcarpa ... 85
„ parviflora ... 86
„ reginæ ... 87
Laurus species ... 88
Lontarus domestica ... 30

MABA buxifolia ... 89
Malvaviscus populneus ... 130
Mangifera domestica ... 90
„ indica ... 90
„ montana ... 90
„ pinnata ... 116
Melanorrhea usittata ... 91

No.

Melia azaderachta ... 19
„ azedarach ... 92
Meliusa velutina ... 93
Meteorus coccineus ... 20
Millingtonia hortensis ... 27
Mimosa alba ... 5
„ amara ... 1
„ Arabica ... 2
„ dulcis ... 82
„ elata ... 3
„ ferruginea ... 4
„ flexuosa ... 7
„ leucophlæa ... 5
„ marginata ... 6
„ odoratissima ... 6
„ serissa ... 7
„ speciosa ... 7
„ stipulata ... 9
„ suma ... 10
„ sundra ... 11
„ xylocarpa ... 83
Mimusops elengi ... 94
„ hexandra ... 95
„ Indica ... 96
Morinda citufolia ... 97
„ exerta ... 98

NAUCLEA cordifolia ... 99
„ orientalis ... 100
„ parviflora ... 100
Nerija dichtoma ... 65
Nerium antidysentricum ... 134

PARKINSONIA aculeata ... 102
Pentaptera arjuna ... 103
„ agustifolia ... 123
„ bialata ... 124
„ coriacea ... 127
„ glabra ... 128
„ obovata ... 128
Phœnix sylvestris ... 104
Phyllanthus embelica ... 105
Plagiotaxis chickrassa ... 46
Poinciana coriaria ... 32
„ elata ... 106
Polyphema jaca ... 17
Pongamia glabra ... 107
Poupartia mangifera ... 116
Prosopis spicata ...
„ spicigera ... 108
Psidium pomiferum ... 109
Pterocarpus bilobus ... 111
„ dalbergioides ... 110
„ marsupium ... 111
„ santalinus ... 112
„ sissoo ... 56

RADEMACHIA integra ... 17
Rhamnus jujuba ... 135
„ nerija ... 65
„ xylopyrus ... 136
Robina mitis ... 107

No.

SANTALUM album 113
Sapindus emarginatus 114
Senna Sumatrana 39
Shorea obtusa 115
„ robusta 132
„ tumbugaia 133
Sitodium cauliflorum 17
Soymida febrifuga 117
Spathodea longiflora 25
„ stipulata 26
Spondias amara 116
„ mangifera 116
„ paniculata 116
Sterculia fœtida 118
Stravadium coccineum 20
„ racemosum 21
„ rubrum 20
Strychnos nux vomica 119
Swietenia chickrassa 40
„ chloroxylon 47
„ febrifuga 117
Syzygium caryophyllifolium... ... 120
„ jambolanum 120

TAMARINDUS indica 121
„ occidentalis 121
Tectona grandis 122
Terminalia arjuna 103
„ berryi 123
„ bialata 124
„ catappa 125
Terminalia chebula 126
„ coriacea 127
„ crenulata 128
„ glabra 128
„ moluccana 125
„ myrobalana... 125
„ reticulata 126
„ subcordata 125
Thespesia populnea 130
Trophis aspera 66

UNONA longifolia 76
Urostigma bengalense 70
„ religiosum 72
Uvaria longiflora 76

VATERIA lanceæfolia 131
Vatica robusta 132
„ thumbagaia 133

WORMIA coromandelina 57
Wrightia antidysentrica 134

ZIZYPHUS jujuba 135
„ sororia... 135
„ mauritiana 135
„ orbicularis 136
„ rotundifolia 136
„ trinerva... 135
„ xylophyra 136

INDEX OF TAMIL SYNONYMS.

No.

AGLAY Murrum ... 46
Angellee „ ... 16
Arasum „ ... 72
Assothee „ ... 76
Aulla „ ... 70
Aunay coondoomany „ ... 12
Autcha „ ... 78
Ayer alingie „ ... 13

CAAT elloopie. Murrum ... 22
„ maah „ ... 116
„ mullee „ ... 27
Cadalipua „ ... 87
Chandanum „ ... 113
Chowk „ ... 42
Coiya „ ... 109
Coorvee allum „ ... 73
Coorokoopully „ ... 82
Coromundalum „ ... 61
Covalum „ ... 4
Cuddapa „ ... 21
Currengally „ ... 10-11
Cutcha cutta „ ... 85

DIVI DIVI Murrum ... 32

EERCOOLEE Murrum ... 65
Eichie „ ... 73
Elavum „ ... 68
Elenday „ ... 135
Elloopei „ ... 23
Ennu muttee „ ... 103
Eroovooloo „ ... 83
Erumbelie „ ... 89

GOTHEE Murrum ... 136

IRRAPOO Murrum ... 52

KUDAKAI Murrum ... 126
Katoo vaugi „ ... 7
Kitchilie „ ... 48
Komboo kullee „ ... 69
Kurroo murdoo „ ... 128
„ vaylum „ ... 2

MAAH Murrum ... 90
Mandareh „ ... 24
Mirole „ ... 145
Mooloo vengay „ ... 29
Mugadum „ ... 94

		No.			No.
Mullay vaimboo	Murrum	92	Seggapoo chandanum	Murrum	112
Munneclah autcha	„	20	Scloopa	„	65
Munjah cudamba	„	99	Shella	„	6
„ konnay	„	89	Shem	„	117
Murrudum	„	127	Shooloondoo	„	84
			Shoray pinnay	„	36
NAT vadam	Murrum	125	Surra konnay	„	43
Nawel	„	120			
Neer cudamba	„	100	THAIKOO	Murrum	122
Neelee	„	105	Thainpoochee	„	77
Neichittie	„	80	Thengai	„	49
Nookoo	„	54	Thudda	„	75
Noonah	„	97	Thrinnah	„	28
Nummai	„	50	Thumbogum	„	133
			Thummurthum	„	18
ODOORAH venga	Murrum	110	Toon	„	45
			Tumballie	„	62
PADRIE	Murrum	25			
Pailæ	„	38	UTTHEE	Murrum	71
Palava	„	96	Uva	„	58
Palla	„	95			
Pannie	„	80	VATHANARINA	Murrum	106
Patunga	„	38	Vapum	„	19
Peenarree	„	118	Vailay	„	102
Peerahie	„	66	Velam	„	74
Peria cschum	„	104	Vella murtheo	„	123
Pinnay	„	34-35-57	Vella naga	„	51
Pilla	„	17	Vel vaylum	„	4-5
Poolie	„	121	Vainga	„	111
Poongu	„	107	Veppalay	„	134
Poorsung	„	130	Vuckana	„	60
Poovandie	„	114	Vuckalee	„	51
Putchalay	„	55	Vum	„	47
			Vunny	„	108
RAMSEITHA	Murrum	14			
			WOOSHALAY	Murrum	1
SAMATRA pullum	Murrum	21	Wothean	„	101
Seekrah	„	1			
Seggapoo konnay	„	44	YETTIE	Murrum	119

INDEX OF TELOOGOO SYNONYMS.

	No.		No.
ADIVIE mamadie	116	Coya	109
Ankooloo	13		
Asseriki	105	DADUGA	99
Ausandra	4	Dirissana	7
		EETA	104
BANDI-GOOROOVINDZA	12	Erru muttee	103
Billo kurra	47		
Buda darmee	38	GHENGHERAVIE	130
Bota cadamie	100	Googilam	132
Bukkapu	33	Gottee	136
		Gurrapa baddam	118
CHANDANUM	113		
Chitikeswaram	106	IPPIE	22-23
Chinangee	86		
Chinna kalinga	57	JUVIE	73
Chintah	121	KAK-WOOLIMERA	60
Conda tangheroo	83	Kalighootroo	25

	No.
Kanugoo	107
Karakaia	126
Kichidie	48
Koonkoodoo	114
Koraman	29
Koree	84
Kuchandanum	112
MAMADI	90
Marri	70
Maydi	71
Molagha	97
Musadi	119
NAREDOO	120
Narikadam	
Nar yeppa	78
Nella maidoo	127
Neeriji	65
Nulla sundra	11
Nulla tooma	2
PASHEE	50
Palla	95
Panasa	17
Paunchee	50
Peda kalinga	58
Pishanna	89
Poghada	94
Ponna	34-35
Poounum	22
Poor	67
Pukkie	66
RAGHIE	72
Reygoo	135
SARALA devaden	28
Schamee	108
Servichettoo	42
Shrekranee	1
Sirimaun	51
Sissu	56
Soimida	117
Sunkeswarnum	106
TARKU VENA	92
Teka	122
Tella maidoo	128
Tella sopora	3
Tella sundra	10
Tella tooma	4-5
Telsoo	6
Tenkaia	49
Tharra	75
Thatta chettoo	30
Tomida	62
Togree moogallee	98
UDOOGOO	13
VADAM	125
Velaga	74
Vepa	19
Ventakoo	85
Virthengee	33
WADDI gampini	101
Woanee	4
Woodoogoo	
YEGIS	111
Yerra patserroo	53
Yerroo goodoo	54

INDEX OF MALAYALUM SYNONYMS.

	No.
ADAMURUM	125
Arealu	72
Aria-bepon	19
Atti-alu	71
Ayenie	16
BALAMPOOLIE	121
Bellingor	
CAAT AMBOLUM	116
Cada pilva	97
Caniram	119
Carcemardoo	128
Carrimariddy	127
Chovan mandaree	24
Congoe	138
ELINGEE	94
Elloopie	23
Elentha	135
Eroopootoo	54
GOTTEE	136
IRAPA	52
KAMARANGA	18
Karinthagara	111
Kodorka	126
Kurro angolum	13
„ valum	2
„ vangay	6
„ vingé	6
MANJATIE	12
Manjenatie	98
Mava	90
Mooloo vangay	29
Myrole	145

	No.
NELLEE	105
OODOORA venga	110
Ooruttah chundanum	112
Oosulay	1
PALAVA	96
Palla	95
Pania	67
Panna	80
Peloa	88
Pela	109
Peralu	70
Perambay	108
Perin-njara	120
Piangany	55
Pelavoo	17
Pongam	107
Ponpadera	25
Poounnum	22
Poona	34-35
RARAK	114
SADACHOO	75
Samudra-poo	21
Shella venge	6
Sjeria samstravidi	20
Syalita	58
TENGA	49
Theka	122
Tinda parua	66
Tsiapangum	33
Tsjandana	113
Tsjeron ponna	36
Tsiela	73
Triucallie	69
VANBOGA	133
Vauga	7
Velanga	74
Vellaynaga	51
Vel vauga	7
WODIER	101
UTTEEALU	71

INDEX OF BURMESE SYNONYMS.

	No.
AING	63
BAMBOI	38
Baib-ya	51
Bjooben	57
CHOOAY	116
ENGYEEN	132
Entha	41
GNO-SHOWOAY	43
HMAN	74
Hseik-khye	114
Htan	30
Hyebin	135
KANAZŒ	78
Kanyeen	64
Kokoh	8
Kyaitha	20
Kya-zoo	126
Kyet-zembuin	59
Ky-woon	122
Kye-zai	88
LATHOW	134
Letkhoke	118
Lettouk	130
Lieun	124
MALAKA	109
Maneoga	37
Maoo	99-100
Mayan	91
Mazalie	89
Mhanbin	98
Mouk show	53
NGA-BAI	101
Ngoo-kyee	43
Ngoo-Thaing	44
PANGAH	129
Pawoon	81
Peddowk	110
Peema-nee	87
Peengadoe	83
Pethan	26
SEET	3-7-9
Seet net	4
Shouaddo	130
Soy-yew	55
TEING-NYET	33
Thayet	90
Tharrapee	34-35
Tengan	80
Tha-byew	58
Thabootkyee	93
Theet khya	40
Theet-see	90
Thembaw-kamakah	19
Theya	115
Thitkadoo	45
Toung Pengnai	15

	No.		No.
Touk-kyan...	103-128	Ywai-gyee	12
Thounben...	16	Young	50
YEEN-GA	57	ZETHA	41
Yendike..	54	Zoung-ya...	18

INTRODUCTION.

Timber, according to the common acceptation of the word, is the hard or ligneous tissue contained in the stem, branches, and roots of trees, and from the peculiar structure of the stem and the manner of growth, Botanists have distinguished them as *Exogenous*, *Endogenous*, and *Acrogenous* stems; the two first are chiefly timber-producing trees.

The stem of exogenous trees consists of a number of concentric layers, and it increases in diameter by the addition of a new layer between the last formed wood and the bark, which is supposed to take place every year, and by which its age may be ascertained to an approximation. In the young plant, it consists of the pith, medullary sheath, medullary rays, and the cambium layer.

The endogenous stem differs from the exogenous in the arrangement of its parts, consisting of cellular tissue, interspersed with vascular bundles, and there is no distinction of parts like the exogenous stem, it has no bark, no concentric layers, and no medullary sheath, as in the stem of a palmyrah tree. This stem once formed, hardly increases in diameter, from the outer parts not being extensible, the central portion is the youngest wood, in which the cellular tissue predominates, and as we approach the circumference, the parts are more and more compact, having more of the woody fibre and less of the cellular tissue, the outer part is the hardest and most dense—this is called the ripe-wood; in the Palmyrah, it is dark brown; and in the Cocoanut, it is of a dark red color.—(*Fig.* 1, *Plate* 1, is the transverse section of an endogenous stem.)

The pith is composed of purely cellular tissue, and it occupies a large place in the stem of young trees, and as the age of the tree increases, in some it gets compressed by the surrounding layers, in others it decays, and the stem becomes hollow in the whole length. The medullary sheath is a tube of fibro-vascular tissue, immediately surrounding the pith, composed of spiral vessels and ducts, which convey the nourishment to the leaves and flowers, and it is said to be the origin of the veins in leaves. The medullary rays are composed of cellular tissue, diverging from the pith, and dividing the stem into wedge-shape plates, and it is the medium by which the sap is conveyed from the leaves to the internal tubes and ducts. The cambium layer is the last concentric zone, between the last formed wood and the bark; it is generally of a light green colour, composed according to Dr. J. H. Balfour "of mucilaginous semi-fluid matter," originating from the descending sap, it forms the wood and the inner bark; and, according to the same author, "may be regarded as constituting the active formative tissue of Dicotyledonous stems."

The wood is formed in the first or second year of a plant, composed of ligneous tissue and ducts, giving out a layer every year: in its prime, the vessels are filled with fluid, as the age increases, those layers that are nearer to the pith, become gradually compressed by the surrounding ones, and the passage of the ducts are also obstructed by earthy and other deposits, so that the texture of the several layers from the pith to the bark is different; those that are nearer to the centre are harder and denser than those that are more remote: this difference of texture in the woody tissue has given rise to the distinction of heart-wood or duramen, and sap-wood or alburnum of Botanists.—(*Fig.* 2. *Plate* 1 is a section of an exogenous stem, where A B is the heart, and B C is the thickness of the sap-wood.)

The sap is the last-formed wood in a tree; in some it is soft and spongy, in others it is dense and hard; the colour also, with few exceptions, is different from the heart, generally white or some shades of it, from its containing a great deal of cellular tissue and fermentable sap, it rapidly decays, and is subject to worms; unless it is seasoned in water or by some other process, when it becomes durable for a time. The amount of sap-wood, in proportion to the heart, is different, and it depends on the nature and age of the tree, and the nature of the soil; the trees in which it takes a long time before the heart is formed, have more sap than those in which the heart is sooner developed. Young trees have more sap than mature ones; some writers assert that in mature trees there is no sap-wood. I have seen superannuated trees, in which the heart-wood was decayed by age, leaving the boles a mere shell, with the bark sap-wood, and a portion of the heart attached all round the inside, and these are still existing, and yearly yield flower and fruit in their proper season.

The heart of the tree is the most durable part of the trunk, and it gives not only strength and stability, but it also maintains a part in the internal economy, and contributes to a certain age in common with the other organs, to the nourishment of the tree. The age in which it begins to form, varies in different trees: in the knotted Cassia (*Cathartocarpus Roxburghi*) it takes from five to six years in good soil; whereas, in the Tamarind, it takes from forty to fifty years; the transition of the sap into heart-wood is not effected in the same way in all trees; in some (as in *Fig.* 3) it is gradual, commencing from the bottom, at the parts immediately surrounding the pith, till each succeeding layer of sap-wood is changed, as in the Terminalias. In others, the change is irregular, occurring at several parts of the trunk, in blotches, at the same time, (*Fig.* 4) which gradually enlarge, and eventually unite, as in the Conocarpus and Ebonaceous trees. In trees where the heart is slowly developed, it is in general small, in proportion to the sap.

The heart-wood differs in colour, in different trees, and is sometimes beautifully variegated and mottled; in the Soyameda febrifuga, the heart is red, in the Satin, yellow, and in the Dalbergias and Ebonies, it is either dark-brown or black.

The different degrees of hardness depends on the nature of the wood, but the different degrees of hardness, of the same species is owing to the nature of the soil, and the locality of its growth; trees growing in loose soil, near banks of rivers, are of quick growth, and usually possess robust trunks; but the wood is found to be softer, and inferior in texture to the wood of those which vegetate in stiffer soil, where the growth is slow, and the trunk of small diameter.

In some trees the wood contains resinous or oily secretions, which tends to their durability, as in the Pine, Teak, and wood-oil trees. Some yield valuable dyes, as the Sappan, Logwood, Morindas, and Pterocarpus'; and some are noted for their fragrance, as in the yellow and red Sanders, Aloes-wood, Sasafras, and Camphorwood.

The heart-wood, is not always sound, even in trees that have not attained their maturity, some of them are either hollow or shaken; the former is attributable to the decay of the pith, and from trees that have grown from cuttings; and the latter, to the effect of strong winds twisting the trees; in such there are generally found in the whole extent of the stem, large deposits of indurated calcareous earth, and in some, the cracks and shakes are filled with fine chalky powder; this is generally found in Teaks; in Saul and Peddowk, lumps of dammer are found in the hollows.

As to the age when the heart is fully ripe, and the tree sufficiently mature for felling, no rules or data can be laid down, as this can only be acquired by the experience of a forest life; but as an approximation, it may be ascertained by boring a small hole in the trunk, so as to ascertain the thickness of the sap, which, compared with the diameter of the trunk, the proportion will be sufficient guide to any one who has some experience in timber. And as to the time of felling, it is a common saying of the natives, that no tree should be felled at the moon's conjunction, and if they are felled at this time, the timber will not be durable, but be subject to worms; the best time considered by them is, when the moon has passed her second quarter during the cold season. After a tree has passed its maturity, the vessels in the heart-wood cease to perform their functions, from being choked up by extraneous deposit, or ruptured by the compression of the surrounding layers, the wood then deteriorates and becomes brittle, and when a piece of it is broken, the fractured part will present irregular granular masses, instead of good fibrous splinters; the change gradually takes place from the bottom of the tree, and progresses upwards till the whole is effected, and eventually decay takes place, commencing at the centre, and works its way outwards till it leaves the trunk nearly destitute of any heart-wood.

The strength of the wood in a tree, chiefly depends on the age, and the nature of the soil on which it grows; the ripe heart-wood of a full grown tree is stronger than that of young, or very old ones: in the former it is weak and flexible, in the latter, it is fragile, possessing little elasticity; trees growing on hard or rocky soil have stronger wood than those which grow in localities where the soil is loose and sandy: the strength of the wood also varies in the different parts of the trunk in immature trees, the wood is stronger at the bottom than at the top, and those which have passed the proper age, the wood at the bottom is more brittle than the upper parts of the trunk.

The strength even varies in the several concentric layers, the wood at the centre is more brittle than in any other part of the diameter; whereas, the layers nearer to the sap is less stiff; and it has been ascertained by experiments, that have been tried at the Gun Carriage Manufactory, that the layers which are situated about $\frac{2}{5}$ from the centre, or $\frac{3}{5}$ from the sap is the strongest wood in mature trees. The state of the wood also affects its strength; if it is green and unseasoned, it is more flexible and weak, and if too dry, it becomes brittle: two pieces 3 feet long, $1\frac{1}{2}$ inches square, were cut from the same scantling, free from knots and other defects, and tested with reference to their transverse strength and direct cohesive power, one in its unseasoned state, and the other after six months seasoning; the first stood 14 half cwts. or 784 lbs.; the latter stood 1,120 lbs.: the cohesive power of the unseasoned wood was 9,158 lbs., whereas the seasoned wood stood 17,450 lbs. to the square inch.

The strength even depends on the direction of the grain; pieces that have the grain running straight and extending the whole length, are stronger than those which have the course of the grain interrupted by knots or bends, or those that have the grain running obliquely, and when a piece is subjected to a breaking weight, it will sustain more, when the direction of the weight acts in the plane of the layers, (*Fig.* 5, *Plate* 1) than when it is at right angles to them. (*Fig.* 6.)

It has also been ascertained by experiments, that cloven timber is stronger than when it is sawn; the cause is obvious from the *cleavage* following the direction of the grain, keeps the fibres continuous; whereas, in sawing, unless the piece is straight, the direction of the grain cannot be followed up by the saw, and more so, when a straight piece is required to be cut from a crooked log, in which case the fibres will not be continuous to the end, but terminate intermediately, and thereby lessening the strength, the weakest point will be at the termination of the fibres.

SEASONING OF TIMBER.

All timbers after being felled must be seasoned in log for some time; for should a log be cut up into half-wroughts in an unseasoned state, the scantlings will more or less warp and crack. The time of seasoning in log varies according to the nature of the wood; those that are hard and compact, will take a longer time than those that are open and coarse-grained. Saul takes from four to five years to season; whereas Teak from two to three years. Some English writers recommend that a log after being felled, should be immediately dubbed or rough squared, and then stowed off under a dry shelter to season ; this process will certainly facilitate the seasoning and may answer in a climate like England, and it may answer for some of the soft timbers even in India; but some of the harder ones will stand a risk of cracking to such a degree during the process of seasoning, especially when the hot winds prevail, as to incur a great waste, when it comes to be cut up.

It is therefore necessary to leave the bark on the logs for a couple of months after felling, and then rough-square them, as round timbers are more liable to crack than squared ones, or which is better, after the log is felled and rough-squared, let it season in water for a month or six weeks, and to facilitate the seasoning, it was recommended by the Superintendent, Colonel Maitland, " to split the logs in two" and then throw them into the water to season, afterwards they can be removed to season under cover, or in the open air. This process not only prevents the wood from cracking to any great extent, and quicken the seasoning; it also imparts a degree of hardness, even to the sap-wood, and renders it impervious to worms. I have known natives in up-countries to fell a tree, and immediately to cut it up into the required scantlings and throw them in a tank, or imbed them in mud for four or five weeks, and after a couple of weeks drying, to use them.

When logs are laid up to season, they should be stacked in tiers; the stacks should not be raised unnecessarily high, as it will entail much labour in extracting a log, and much space will have to be taken up if they are low; every stack should consist of from four to five tiers, according to the size of the logs. The following method is practised at the Gun Carriage Manufactory:—After the logs are numbered, measured, and registered, the highest ground is selected for a site, from which grass and weeds are cleared off, and levelled; then two wooden sleepers, from 6 to 8 inches in depth (and more if the ground is yielding) are laid down, at a parallel distance of less than the length of the logs, and the length of the sleepers are a little more than the length of the stack; the first tier is laid at right angles to the sleepers, and every succeeding tier is placed at right angles to the one upon which it rests, and a space of a few inches is allowed between each log, to allow a free circulation of air: there should be ample space around each stack, for the purpose of taking out any log that may be required, and every log should be accessible for inspection.

When logs are sufficiently seasoned and cut into half-wroughts, they cannot be immediately used, as the wood will still retain a portion of moisture that requires to be evaporated; it should therefore be kept up to season for a further period. In cutting the half-wroughts, they should be cut a little larger every way than the required dimensions, to provide against shrinkage and cracks; the amount of excess will depend upon the nature and the state of the wood when cut, and the size of scantling: for scantlings that are under 6 inches, an excess from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in thickness and breadth, and from 3 to 6 inches in the length will be sufficient; for scantlings above that size, an excess of $\frac{1}{2}$ inch will be sufficient in breadth and thickness, and from 6 to 12 inches in the length.

Before the half-wroughts are stowed off to season, the ends should be protected, to prevent them from cracking. The practice in the Manufactory is to have the ends plastered with a composition of two parts o cow-dung to one of clay, and when the plaster is perfectly dry, they are stacked up to season. In stacking the half-wroughts, it should be carefully observed that there is sufficient space between each half-wrought, and between each tier, to allow a free circulation of air; the first is done by placing the half-wroughts from ½ to 1 inch apart, and the second by inserting two slips of wood, from ½ to ¾ inch in thickness, between the tiers.

The time of seasoning in half-wroughts depends on the nature of the wood and the size of scantling, some woods season sooner than others. Tredgold observes, that a scantling is sufficiently seasoned, when it has lost $\frac{1}{5}$ of its weight. Duhamel and others, from their experiments, think it is not sufficiently seasoned, especially for joinery, until it has lost $\frac{1}{3}$ of its weight. Teak-wood scantling, from 3 to 6 inches in depth, takes from six to twelve months to season, and from one to two years for scantlings up to 12 inches. Saul-wood scantling, under 3 inches, takes twelve months, and from 3 to 6 inches two years, and from 6 to 12 inches it takes two to four years to season. As Saul-wood takes a long time to season, to hasten it an experiment was tried by boiling the wood in tannin water, it proved successful; but the time gained did not compensate for the expense and amount of labour it entailed; moreover, according to Mr. Tredgold, steaming or boiling impairs the two most essential qualities in wood, viz., its strength and elasticity, the two necessary requisites in the construction of Ordnance Carriages.

ON THE PRESERVATION OF TIMBER.

On the preservation of timber, its durability greatly depends, and if the surface is left unprotected, from the porosity of its nature it is subject to hygrometical changes, which has an injurious effect in splitting the wood and making it liable to premature decay, especially in a country like India, where it has to stand extreme heat and dryness for a greater part of the year, and the heavy rains which are also accompanied with heat, and the heavy fogs which are immediately succeeded by a powerful sun; it cannot be expected that even the best seasoned timber could stand this alternation of moisture and heat without splitting, in many instances followed by symptoms of approaching decay; for " warmth and moisture," observes Mr. Tredgold, " are the most active causes of decay.' It has also been observed, that naked woods suffer much during the foggy months of January and February; and in the hot months of May, June and July, even painted woods are not exempt from cracking. To prevent these injurious effects, the surface is generally covered by a coat of some medium, so as to fill up the pores and render the wood impervious to moisture, and for works that have to be exposed to the action of the weather, a thick coat of paint, or a mixture of pitch and tar, has been found sufficient to protect the surface, provided that the wood is well seasoned, otherwise the confined sap in the wood having no way of escape, will putrify and hasten its decay.

Different methods have been proposed for the preservation of timber; it is said of the Dutch, that for all their out-door works, which have to stand the effect of the weather, such as draw-bridges, sluices, and other works, they coat them with a mixture of pitch and tar, upon which are strewn pounded shells, mixed with sea sand, or the scales of iron from a blacksmith's forge, beaten small and sifted. Mr. Tredgold says that sanded-painting, that is, strewing particles of fine sand upon the painting before it is dry, is much more durable than common painting; and another method Mr. Temple recommends in his work on aquatic buildings, and which is approved of by Mr. Tredgold, he proposes to subject the timbers to a scorching heat of wood-fire, and while still hot, rubbing it over with a mixture, in a heated state, of linseed oil and tar in equal parts; this mixture, it is said, will penetrate an inch or more into seasoned wood, and render it hard and durable. A mixture of asphalte, with a small portion of lamp-oil, has also been found a good protection for woods of water works, when they are alternately exposed to moisture and heat. The natives have a practice of charring the ends of such woods, which have to be fixed in a wall, and smearing it with a mixture of tar and oil, which renders them not only durable, but it is also a good preventative against the ravages of white-ants; they have also a practice of smoking woods, by hanging them over a chimney fire for a time, and I have even seen bamboos rendered durable by this process.

Kyan's process of saturating timber in a solution of corrosive sublimate, is an effectual method of rendering it durable and efficacious against insects; and an experiment was tried at the Gun Carriage Manufactory on some Europe and country woods, which are known to be greedily devoured by white-ants; these were afterwards exposed in places much infested with them, and after a lapse of a full year they were found to be untouched.

Saturating timber in oil has been found effectual against worms and white-ants; the application of Gurgun balsam, or wood-oil, is used in India for the protection of building timbers, such as beams and joists; and a mixture of vegetable wax, with a small portion of nitric acid, in proportion of 25 lbs. of the former to an ounce of the latter, was tried at the Arsenal of Fort Saint George on woods, and found to secure them from the attack of white-ants. I have also known the application of lamp-oil to render wood exempt from their attacks: and since worms and insects have an aversion for bitter woods, I think, as an excellent protection against them, to heat the wood, as in Mr. Temple's process, and smear them over with Nim or Margosa oil; and to render the oil dry, mix it with a small portion of litharge; it will be cheaper and as effectual as Kyan's or any other process.

It is necessary to observe that whatever may be the medium used to protect the surface of woods, unless it is occasionally renewed, it cannot be expected that it will always retain its pristine nature, and answer the purpose for which it is intended, from the materials of the composition themselves being of a more perishable nature than wood.

ON THE STRENGTH OF TIMBER.

All timbers used in Engineering and in the Mechanical arts, are subject to several strains, according to the direction of the force to which the scantling is exposed, its position, and in the manner it is supported or fixed; and there are three which frequently come under the notice of the Engineer and Mechanic.

1st. *Direct or Tensile strain.*—When a force acts in the direction of the grain, so as to tear the fibres asunder, as in king-posts and tie beams.

2nd. Compression or crushing force.—When the force acts in the direction of the grain, so as to crush the fibres of the wood together, as in posts and struts.

3rd. Transverse strain.—When the force acts perpendicularly or obliquely to its length, so as to break it across, as in rafters and beams of flat roofs.

ON THE DIRECT COHESION OF TIMBER.

The strength of timber to resist a strain, in the direction of the length, is directly proportional to the area of the transverse section, and the direct cohesive power of the fibres: the cohesive power of the wood is the greatest in the direction of the fibres, and it has been found that the straighter the grain of the wood, the better it resists rupture; fibrous woods resist better than those that are dense and close-grained.

My experiments for the direct cohesion of timber were made with the same kind of apparatus, as given in Barlow's work, (*see Plate* 3) and the specimens were of the same dimensions as given by him, the middle part was correctly turned down $\frac{3}{10}$ and some of the stronger woods $\frac{1}{4}$ of an inch in diameter to 1 inch in length; every specimen was accurately gauged before being tested. The experiments were conducted under my own supervision, and the formula was calculated by myself.

Experiments on the direct cohesion of the following woods:—

Number of experiments.	Names of the Wood.	Area of Section.	Fracturing weight in lbs.	Weights reduced to a square inch in lbs.	Mean value of direct cohesion in lbs.
1	Rose or Blackwood.	·0706	1,456	20,623	20,283
2	Do. do.	·0706	1,344	19,036	
3	Do. do.	·0706	1,792	25,382	
4	Do. do.	·0706	1,232	17,450	
5	Do. do.	·0706	1,456	20,623	
6	Do. do.	·0706	1,512	21,416	
7	Do. do.	·0706	1,232	17,450	
1	Baubool.	·0706	1,120	15,864	16,815
2	Do.	·0706	1,456	20,623	
3	Do.	·0706	784	11,104	
4	Do.	·0706	1,680	23,796	
5	Do.	·0706	896	12,691	
1	Pawoon.	·0706	1,904	26,968	26,571
2	Do.	·0706	1,792	25,382	
3	Do.	·0706	1,792	25,382	
4	Do.	·0706	2,016	28,555	

To determine the direct cohesive power of any timber.

RULE :—Multiply the area of the transverse section by the tabular value C, of that particular wood, and the product will be the weight—¼ of the product is used in practice.

What weight will it require to tear asunder a king-post, made of Trincomallee wood, 6 ″ × 3″? Tabular value of C being equal to 26,704, area of section 18 inches.—(26,704 × 18)=480,672. Ans. in lbs.

Determine the diameter of a rod of Jack wood which will sustain a strain of 10 tons, when the strain will be in the centre of the transverse section. Let *d* represent the diameter of the rod.

Tabular value of C = 16,420. No. of lbs. in 10 tons = 22,400, four times this used in practice = 89600.

$$d = \sqrt[2]{\left(\frac{89,600}{16,420 \times \cdot 7854}\right)} = 2\cdot 63 \text{ inches.}$$

ON THE TRANSVERSE STRENGTH.

The strength of timber exposed to transverse strain is—

1st.—Directly proportional to the breadth, that is, if two scantlings of different breadth, one 3 and another 6 inches, having the other dimensions equal, the strength will be as 1 to 2.

2nd.—Inversely proportional as the length, that is, two pieces of the same breadth and depth, but different in length; say, the one 3 feet and the other 9, the strength of the former to that of the latter will be as 3 to 1.

3rd.—As the square of the depth, that is, if the scantlings are of the same length and breadth, but varying in depth, say one to be 2 and the other 3 inches, their strength will be as 4 to 9.

When a beam is exposed to transverse strain, whether that strain is exerted in the middle or distributed over the whole length, it is resolved into two other forces, producing different results, the one tearing and the other compressing the parts of the wood at the point of fracture, (as in *Fig.* 1, *Plate 2*, A B C D represents a beam, supported at both ends, and under the effects of a fracturing force; it is evident that when the beam is deflected, the fibres in the lower parts will be in a state of extension, and the line D C will be longer than F G or A B, and as the deflection increases, the line D C gets more and more elongated, till the fibres are ultimately torn asunder, as in *b*, *c*, *d*, *e*; while the upper triangular portion *a, b, c,* from compression breaks short, as if separated by a saw; the line of separation of these two forces, or that part where the effects of these forces are equal, is called the " neutral axis or plane." Barlow and others have found it to be from ⅓ to ½ of the depth, in beams supported at one end, and loaded at the other, and ⅝ of the depth in beams supported at both ends, and loaded in the middle. In my experiments I have found it about ⅝ of the depth in very fibrous woods, and from ½ to ⅓ in those that were less fibrous; but in brittle woods it could not be distinguished.

My experiments were made with pieces, supported at both ends, 3 feet in length or 2 feet 10 inches within the supports, and 1½ inch square, and some 2 feet long or 22 inches within the supports, and 1 inch square, and the weights used were half cwts. or 56 lbs.; the deflections were accurately taken with a decimal scale of brass inserted in a groove of a horizontal iron bar and sliding very freely, (*see Plate* 4).

Experiments on the elasticity, stiffness, and transverse strength of the following woods:—

No. of experiments.	Names and dimensions of the Woods.	Weight p and the corresponding deflection δ.		The measure of elasticity $E=\frac{L^3\,p}{bd^3\delta}$.	Co-efficient for comparative stiffness $S\,\frac{40\,b\,d^3\,\delta}{L^3\,p}$.	Breaking weight in lbs.	Co-efficient for comparative strength. $P=\frac{L.\,W.}{b\,d^2}$
		weight in lbs.	D eection in inches.				
1 2 3 4 5 6	Thumbagum wood, 3 feet or 2⅚ feet, within the supports, by 1½ inches square....	478 478 478 478 478 478	·5 ·5 ·4 ·5 ·7 ·4			1,262 1,150 1,150 1,262 926 1,262	
	Mean results ...	478	·5	4,296	·0093	1,168⅔	981
1 2 3 4 5	Malabar Teak, 3 feet or 2⅚ feet, within supports by 1½ inches square................	478 478 478 478 478	·55 ·5 ·5 ·6 ·55			926 1,038 1,150 814 926	
	Mean results	478	·54	3,978	·0100	970⅘	814
1 2 3	Satinwood, 3 feet or 2⅚ feet, within supports by 1½ inches square................	478 478 478	·5 ·55 ·5			1,374 814 926	
	Mean results....	478	·516	4,163	·0096	1,038	870

The following formulæ, for finding the transverse strength of beams, are taken from Tredgold's, where the length is taken in feet, the breadth and depth in inches. If l is the length, b the breadth, and d the depth, W the breaking weight, and P the co-efficient for comparative strength.

1*st*:—For a beam that is supported at both ends and loaded in the middle, the formula is thus expressed.

$$W = \frac{b\,d^2}{l} P.$$

Rule:—Multiply the breadth by the square of the depth, and that again by the co-efficient for comparative strength for the particular wood, and divide the product by the length, the quotient will be the breaking weight.

Find the weight that will break a scantling of Ven Teak, which is 6 feet in length within the supports, 4 inches broad, and 5 inches deep.

$$W = \frac{4 \times 5^2.}{6} \times 619 = 10{,}316\tfrac{2}{3} \text{ lbs.}$$

2nd.—When the beam is supported at both ends, and the load is uniformly distributed over the length, it will break with twice the weight.

$$W = 2\frac{b\,d^2}{l} P.$$

What is the ultimate strength of a Saul wood bressummer, which is 20 feet within the supports, 7 inches broad and 12 inches deep, the weight to be uniformly distributed over the length? The co-efficient of comparative strength for Saul-wood is 880.

$$W = 2\frac{7 \times 12^2}{20} \times 880 = 88{,}704 \text{ lbs.}$$

3rd.—When a beam is fixed at both ends and loaded in the middle, its strength will be to that of a beam merely supported at the ends as 3 : 2 that is,

$$W = \tfrac{3}{2}\left(\frac{b\,d^2}{l} P.\right)$$

Rule:—Multiply the breadth into the square of the depth, and that again by the co-efficient for comparative strength of the particular wood three times, this product divided by twice the length, will give the breaking weight.

What weight will break a Venga wood beam fixed at the ends and 12 feet within the supports, having a trans verse section of 6 inches breadth and 8 inches in depth ? The co-efficient for comparative strength for Venga wood is 868.

$$W = \frac{3}{2}\left(\frac{6 \times 8^2}{12} \times 868\right) = 41{,}664 \text{ lbs.}$$

4th.—When a beam is fixed at both ends, and the weight uniformly distributed over the length.

$$W = \frac{3bd^2}{l} P.$$

RULE :—Divide three times the product of the breadth, square of the depth, and the co-efficient for comparative strength of the particular wood by the length.

What weight will break a joist of Thingan wood, being 14 feet within the supports, 3 inches broad and 5 inches deep ? The co-efficient of comparative strength for Thingan is 706.

$$W = \frac{3 \ (3 \times 5^2)}{14} \times 706 = 11{,}346 \text{ lbs.}$$

5th.—When the beam is fixed at one end, and the load applied at the other, its ultimate strength will be—

$$W = \frac{bd^2}{4l} P.$$

RULE :—Multiply the breadth into the square of the depth, and that again by the co-efficient for comparative strength of that particular wood, the product divided by four times the length will give the breaking weight.

What weight applied at the end will break a Baubool scantling projecting 5 feet from a wall and 1½ inch square ? The co-efficient for comparative strength for Baubool is 884.

$$W = \frac{1\frac{1}{2} \times (1\frac{1}{2})^2}{4 \times 5} \times 884 = 149\tfrac{7}{40} \text{ lbs.}$$

6th.—When the beam is fixed at one end, and the load uniformly distributed over the length, its strength will be double that of the above.

$$W = \frac{bd^2}{2l} P.$$

What weight, if uniformly distributed over the length, will break a piece of Margosa or Nim wood, 4 inches square, fixed in a wall, and projecting 8 feet ? The co-efficient for comparative strength for Margosa is 720.

$$W = \frac{4 \times 4^2}{2 \times 8} \times 720 = 2{,}880 \text{ lbs.}$$

7th.—When the beam is supported at the ends, and the load applied to any part, its ultimate strength will be

$$W = \frac{2\,b\,d^2}{a\text{-}c}\ P.$$

Where a and c (*Fig.* 2, *Plate* 2) are the distances of the point of application of the load from the points of support, then $a + c = AB = l$ the length: the formula expressing the strength is thus deduced.

If a load W is supported by two props, the pressures on A and B will be

$$\text{as } l : c :: W : \text{pressure on A.}$$

$$\text{Pressure on A} = \frac{c\,W}{l}$$

$$\text{as } l : a :: W : \text{pressure on B.}$$

$$\text{Pressure on B} = \frac{W\,a}{l}$$

Now if we conceive two weights equal to these pressures to be placed on the beam at A and B, and a fulcrum to be placed at W, it is manifest that the beam will be subject to the same strains as before, for the three forces acting at A W and B in the last case, are equal to the three forces acting in opposite directions. But in the last case $\frac{W\,c}{l}$ acting at A will manifestly produce a strain on the fulcrum at W proportional to the weight multiplied by the arm of the lever (a) that is equal to $\frac{W \,.\, a \,.\, c.}{l}$ equal also to the pressure on B which serves to balance the pressure at A, hence if W and l are given, the strain is proportional to $a \times c$, and is the greatest, when W acts in the middle of A B (*vide* Cape, Article 192, Prob. 5, Statics) since the strain is proportional to $a \times c$ it will vary as $\frac{a \times c}{l}$ and substituting this for the length, in the general formula, the equation will be $\frac{b\,d^2}{\frac{a\,c}{l}} = \frac{l\,b\,d^2}{a\,c}$ hence

$$W = \frac{l\,b\,d^2}{a \times c} \times \frac{P}{4} = \frac{2\,b\,d^2}{a \times c} \times P.$$

Rule:—Multiply together the breadth, square of the depth, and the co-efficient for comparative strength, twice this product divided by the product of the distances of the two extremities from the point of application of the load, the quotient will be the breaking weight.

What is the ultimate strength of a Peemah scantling 8 feet within the supports, and having a transverse section of 4 inches in breadth and 6 inches deep? Suppose the load to act at 2 feet from one extremity. The co-efficient for comparative strength for Peemah is 692.

$$W = \frac{2\,(4 \times 6^2)}{6 \times 2} \times 692 = 16{,}608 \text{ lbs.}$$

8th.—To determine the strength of a beam inclined to the horizon fixed at one end and loaded at the other.

In this case the beam is not effected by the whole force, for if A B, (*Fig. 3, Plate 2*) represents a beam with a weight W acting at its extremity, make B *c* equal to the weight, and draw *a c* perpendicular to A B, the force B *c* is resolved into two, one in the direction of A B equal to *a b*, and the other in the direction of *a c*, the line *a c* will be equal to the fracturing force, putting *y* as the angle *a c* B or B A W, we have, as

$$W : a\,c :: 1 : cos.\ y.$$

Hence the strength according to the general formula will be—

$$W = \frac{b\,d^2}{l\ cos.\ y} \times \frac{P}{4}$$

Rule :—Multiply together the breadth, square of the depth, and the co-efficient for comparative strength, this product divided by four times the length multiplied into the cosine of the angle of the slope, will give the breaking weight.

What is the utmost strength of a crane jib of Teak wood, the length being 10 feet, breadth 4 inches, and depth 6 inches, the angle of the slope being 36°.

$$W = \frac{4 \times 6^2}{10 \times .80902} \times \frac{814}{4} = 3{,}622 \text{ lbs.}$$

ON THE STIFFNESS OF TIMBER.

Stiffness is defined as that property in materials, by which they resist flexure, under a certain amount of force, and a beam of timber is said to be stiff, or flexible comparatively, according to the amount of deflection produced with a given weight: if two scantlings of equal dimensions are subjected to the same pressure, under the same condition, that which has a greater bend, is said to be flexible, and the other stiff; the force which restores a beam to its original condition is called its elasticity.

The following is taken from Mr. Barlow's work:—

Beams of equal length, and varying in breath and depth, the deflection will be directly as the weight, and inversely as the breadth and cube of the depth. And it has been found by experiment that when a beam is subjected to a bending force, the amount of deflection, to a certain limit, is directly as that force.

If the length vary, and all the other things being the same, the deflection will be directly as the cubes of the lengths.

From the above proportion the deflection is directly, as the weight, and the cube of the length, and as the breadth, and cube of the depth inversely, that is the elasticity.

$$E = \frac{W\, l^3}{b\, d^3\, \delta} \text{ inches.}$$

Where W is the weight, l the length in feet, and b the breadth, d the depth, and δ deflection in inches.

Beams of the same length, and with equal transverse section, the deflection of a beam which has the weight acting at its extremity, is to that which has the same weight equally distributed over its length as 8 to 3, and if the beam is supported at both ends the deflection will be as 8 to 5.

The deflection of a beam fixed at one end, and loaded at the other, is four times that of a beam of twice the length supported at both ends, and loaded in the middle with equal weight, when the length and weight are both equal, the deflections will be to each other as 1 to 32.

In practice, observes Mr. Tredgold, the comparative stiffness is of more importance than its comparative strength, and in order to preserve the same stiffness in beams, it is suggested by Mr. Barlow that the depth be increased in the same proportion as the length; the breadth remaining the same. According to Mr. Tredgold the deflection should be inversely as the length, and to have the deflection proportional to its length, the weight the beam will have to sustain, will be as the breadth, and cube of the depth directly, and as the square of the length inversely, that is,

$$W = \frac{b\, d^3}{S \times l^2}$$

Where l is in feet, b and d in inches, and S the co-efficient for comparative stiffness. The co-efficient was calculated according to Tredgold's formula $S = \frac{40\, b\, d^3 . 8}{p\, l^3}$ in which he allows $\frac{1}{40}$ of an inch deflection for every foot in the length: δ is the deflection produced by the weight p.

For beams supported at both ends.

To calculate the size of scantlings that will sustain a given weight, to find the depth, when the length breadth and weight are given.

$$D = \sqrt[3]{\left(\frac{W\, l^2\, S}{b}\right)} \text{ inches.}$$

Rule:—Multiply together the weight, square of the length and the co-efficient for comparative stiffness, this product divided by the breadth and the cube root of the quotient will be the depth.

What depth must be given to a Pengaudoo beam, which is 18 feet within the supports and 5 inches in breadth to support 600 lbs. The co-efficient for comparative stiffness is ·0093.

$$D = \sqrt[3]{\left(\frac{600 \times 18^2 \times \cdot 0093}{5}\right)} = 7{\cdot}12 \text{ inches.}$$

$$\text{To find the breadth } b = \frac{W\, l^2\, S}{d^3}$$

Rule:—Multiply the weight by the square of the length, and that again by the co-efficient for comparative stiffness, this product divided by the cube of the depth, the quotient will be the breadth.

What breadth can be given to a Peddowk beam 20 feet within the supports, and 9 inches deep to sustain 1,000 lbs? The co-efficient for comparative stiffness is ·0095.

$$b = \frac{1000 \times 20^2 \times \cdot 0095}{729} = 5{\cdot}212 \text{ inches.}$$

When the weight is uniformly distributed over the length.

From what has already been stated, that the deflection of a beam loaded in the middle, to that which has the load uniformly distributed over the length to be as 8 to 5, the general formula becomes modified, and is thus expressed.

$$\frac{5\,W}{8} = \frac{b\, d^3}{S\, l^2} \text{ inches.}$$

What depth can be given to a Saul-wood joist of 15 feet in length and 4 inches in breadth to sustain 1,000 lbs? The co-efficient for comparative stiffness for Saul is ·0094.

$$d = \sqrt[3]{\left(\frac{\frac{5000}{8} \times 15^2 \times \cdot 0094}{4}\right)} = 6{\cdot}9 \text{ inches.}$$

When the beam is inclined, let (*a*) denote the angle of inclination.

$$d = \sqrt[3]{\left(\frac{\frac{5\,W}{8}\,l.^2\,S.\ \mathit{cos.}\ a}{b}\right)}\ \text{inches.}$$

What depth can be given to a Palmyrah rafter 16 feet long, 2½ inches broad, to sustain 500 lbs. when the slope is 1 to 1, or an angle of 45°? The co-efficient for comparative stiffness for Palmyrah is ·0081.

$$d = \sqrt[3]{\left(\frac{\frac{2500}{8} \times 16^2 \times \cdot 0081 \times \sqrt{\frac{1}{2}}}{2\frac{1}{2}}\right)} = 5{\cdot}67\ \text{inches.}$$

ON THE DIMENSIONS OF PILLARS AND COLUMNS PRESSED IN THE DIRECTION OF THEIR AXIS.

For Square Pillars.

Rule:—Multiply the weight by the square of the length, the product divided by 2·5 times the tabular value of E, and the fourth root of the quotient will be the side of the square.

For Cylindrical columns take 1·5 times the tabular value of E and a fourth root of the quotient will be the diameter.

The above rule taken from Barlow's, is acknowledged by him to produce results, "too small to be used in practice. The rule only shows "the extreme load that can be supported by a pillar under the theoretical "condition, that the pressure exactly coincides with the axis of the pillar." In comparing the result by this rule with that of Mr. Tredgold's which comes nearer to practice, I find that it is nearly one-half, and to make the result by Mr. Barlow equal to that of the latter author, we have only to multiply the fourth root of the quotient by two, and it is observed by Mr. Tredgold, that a column, or pillar, should seldom be loaded with one-fourth of the weight that would produce sensible flexure.

Required the side of a square post of Aucha wood, 10 feet in length to bear 4 tons, the pressure being in the direction of the axis.

The value of E for Aucha wood is 4,599, and if *d* represents the side or diameter of the post then

$$d = \sqrt[4]{\left(\frac{896 \times 10^2}{2{\cdot}5 \times 4{,}599}\right)} \times 2 = 5{\cdot}8\ \text{inches.}$$

Required the diameter of a cylindrical post of Satin-wood, 8 feet in length, to bear 3 tons?

The value of E for Satin-wood is 4,163.

$$d = \sqrt[4]{\left(\frac{6{,}720 \times 8}{1{\cdot}5 \times 4163}\right)} \times 2 = 5{\cdot}6\ \text{inches.}$$

ON THE MEASUREMENT OF TIMBER.

The content of timber in log or scantling is calculated and valued by the cubic foot, and the pieces are designated, according to the size, shape, and its position in the trunk of the tree, by names peculiar to the trade, as Loozars, Duggies, Chowkers, Dowkers, Arties, Shinbins, and Bindoo planks.

Loozars are large logs, less than 20 feet in length, rough squared and nearly of the same breadth and depth throughout. Duggies are logs above 20 feet in length and of an irregular breadth and thickness. Chowkers are logs which have the four sides squared. Dowkers are logs that have only two sides squared. Arties are centre portions of a log with the pith, while the better part of the wood is taken off. Shinbins are portions of a log broken lengthwise, of an irregular breadth and thickness. Bindoos are planks sawn square to any regular breadth and less than 6 inches thick.

In measuring timber, logs that have their transverse section, a square or oblong figure, the breadth and depth should be taken: if they are round or nearly so, they should be girted: and when a log is partly round, and partly square, or have the angles much rounded off, it is safer to girt, than taking the breadth and thickness. In Madras, the native timber merchants have a very doubtful way of measuring their timber, they apply two straight edged pieces of wood to the sides of the log to be measured, and they measure the distance between them, at the upper and lower extremities, and the mean of the two measurements is taken as the side or diameter of the log. The natives of the Tamil caste calculate the content in feet and inches, and the fractional parts in eighths and sixteenths. On the Malabar Coast, the content is calculated by Koles and Vurruls, a Kole is equal to 28 English inches, and a Vurrul is equal to $1\frac{1}{6}$ of an inch.

SUPERFICIAL CONTENTS.

The content of boards are reckoned and valued according to the superficial feet; and Sawyer's work is estimated in the same way, a *noole* or line of Sawyers' work is reckoned at 24 superficial feet, charged from 4 to 6 Annas according to the depth of cut, and the hardness of the wood.

To find the superficial content of boards, multiply the length by the mean breadth : if the dimensions are given in feet, the product will be the content in superficial feet: if the length is taken in feet, and the breadth in inches, divide the product by 12 for the content in feet and inches; and if the dimensions are given in inches, divide by 144 inches. If the board tapers, take the breadth at the two ends, and half the sum will be the mean breadth. If it is of an irregular breadth, take several breadths, and the sum divided by the number of breadths taken, will give the mean breadth.

What is the value of a Mangoe plank 15½ feet in length and of an irregular breadth, measuring 21, 16, 13 and 11 inches at 3 Annas 6 Pice per foot?

$$\frac{21 + 16 + 13 + 11}{4} = 15\tfrac{1}{4} \text{ inches the mean breadth.}$$

$$\begin{array}{ll} \text{Ft.} \quad \text{Ins.} & \text{Ft.} \quad \text{Ins.} \\ \dfrac{15\frac{1}{2} \times 15\frac{1}{4}}{12} = & 19 \quad 8\frac{3}{8} \end{array}$$

$$\begin{array}{llllll} \text{Ft.} & \text{Ins.} & \text{A.} & \text{P.} & & \text{RS. A. P.} \\ 19 - & 8\frac{3}{8} \times & 3 & 6 & & 4-4-11\frac{5}{15} \end{array}$$

CUBIC CONTENTS.

For Square Timber.

Rule:—Multiply the length by the breadth and depth, the product will be the content in feet, if the dimensions are taken in feet. When the length is taken in feet and the breadth and thickness in inches, divide the product by 144 for feet, and the remainder, if any, by 12, for inches and parts.

If the log tapers regularly, take the breadth and depth at the two ends, and half the sum will be the mean, then proceed as in the rule.

If the log is of an irregular breadth and thickness, take several breadths, the sum divided by the number of breadths taken will give the mean breadth, do the same for the mean thickness, then proceed as in the rule.

What is the content of a log 20¼ feet in length, the breadth at three different places were 18, 16 and 13 inches, and the thickness 16, 14 and 11 inches?

$$\frac{18+16+13}{3} = 15\tfrac{2}{3} \text{ inches the mean breadth.}$$

$$\frac{16+14+11}{3} = 13\tfrac{2}{3} \text{ inches the mean thickness.}$$

$$\begin{array}{l} \text{Ft.} \quad \text{In.} \quad \text{In.} \qquad\qquad \text{C.Ft.} \quad \text{In.} \quad \text{Pts.} \\ \dfrac{20\frac{1}{4} \times 15\frac{2}{3} \times 13\frac{2}{3}}{144} = \dfrac{4335\frac{3}{4}}{144} = 30 - 1 - 3\tfrac{3}{4} \end{array}$$

To find the cubic content of round or unsquared timber.

Rule :—Multiply the length by the square of the quarter girt, or one-fourth of the mean circumference.

The rule gives a little less than the actual content of the log; this is allowed to purchasers on account of sap-wood, hollows and other defects which are generally found in round or unsquared timber.

What is the content of a log measuring $22\frac{1}{3}$ feet in length, having a circumference of 53 inches at the greater end, and 33 inches at the smaller end?

Ins.
53
33
2) 86
4) 43
$10\frac{3}{4}$ = $\frac{1}{4}$ of the mean circumference.
$10\frac{3}{4}$
$\frac{9}{16}$
$7\frac{1}{2}$
$7\frac{1}{2}$
100 144) $2580\frac{43}{48}$ (17
$115\frac{9}{16}$ 144
$22\frac{1}{3}$ 1140
$\frac{3}{16}$ 1008
$38\frac{1}{3}$ 12) 132
$12\frac{3}{8}$ 11
230 C.F. INS, PTS.
230 Cubic content = 17—11—$0\frac{43}{48}$
$2580\frac{43}{48}$

When a log does not taper regularly, but is of such a shape (as in *Fig.* 4, *Plate* 2), several girts will have to be taken as at AB, CD, EF, GH, the sum of which divided by the number of girts taken will give the mean girt: then proceed as in the rule.

What is the value of a log measuring $23\frac{1}{2}$ feet in length, and girting 60, 42, 52, and 30 inches at four different places at 1 Rupee 8 Annas per foot?

By Fractions.

INS.
60
42
52
30
4) 184
4) 46 =mean girt.
$11\frac{1}{2}$=mean quarter girt.
$11\frac{1}{2}$
$\frac{1}{4}$
$5\frac{1}{2}$
$5\frac{1}{2}$
121
$132\frac{1}{4}$ = square of mean quarter girt.

INS.
$132\frac{1}{4}$
$23\frac{1}{2}$
$66\frac{1}{8}$
$5\frac{3}{4}$
396
264 C. F. IN. PTS.
144) 3107 $\frac{7}{8}$ (21 6 $11\frac{7}{8}$
208
227
144
12) 83
6—11

By Duodecimals.

FT. IN. PTS.
0-11- 6
0-11- 6
0-10- 6- 6
0- 0- 5- 9
0-11- 0- 3
23- 6- 0- 0
21- 1- 5- 9
0- 5- 6- 1-6
Ft. 21- 6-11-10-6

	RS. A. P.
	1-8-0
	21
	31- 8-0
Inches... 6 = $\frac{1}{2}$	0-12-0
Parts..... 8″ = $\frac{1}{9}$	0- 1-4
2″ = $\frac{1}{4}$	0- 0-4
1″ = $\frac{1}{2}$	0- 0-2
6‴ = $\frac{1}{2}$	0- 0-1
3‴ = $\frac{1}{2}$	0- 0-0 $\frac{1}{2}$
1‴ = $\frac{1}{3}$	0- 0-0 $\frac{1}{6}$
6⁗ = $\frac{1}{2}$	0- 0-0$\frac{1}{12}$
	32- 5-11$\frac{3}{4}$

C.F. INS. PTS. ‴ ⁗
21- 6-11-10-6 = cubic content.

RS. A. P.
32-5-11$\frac{3}{4}$, the value.

When a log is crooked or irregular (as in *Fig.* 5, *Plate* 2), divide it into lengths, find the content of each, and the sum will be the content of the log.

What is the content of a log of the following dimensions (*see the same Fig.*) AB 5 feet, BC 8 feet, CD 6 feet, the girt at *ab* 30 inches, *cd* 16, *ef* 18, *gh* 20, and *ij* 16 inches ?

Ins.
ab = 30
cd = 16
2) 46 mean girt.
4) 23
5-9″
5-9
2-4-9-‴
4-3-9″″
0-2-9-0-9
5-0-0-0-0
Feet 1-1-9-3-9 content of *a b d c*.

Ins.
cd = 16
ef = 18
2) 34
4) 17
4-3
4-3
0-1-5-0-0
0-0-1-0-9″″
0-1-6-0-9
8
1-0-0-6-0 *c d f*.

Ins.
ef = 18
gh = 20
ij = 16
3) 54
4) 18
4-6
4-6
0- 1-6-0
0- 0-2-3-0
0- 1-8-3-0
6- 0-0-0-0
0-10-1-6-0 content of *g h j i*.

	Ft.	Ins.	Pts.	Th.	Fths.
	1	1	9	3	9
	1	0	0	6	0
	0	10	1	6	0
Total...	2	11	11	5	9

EXPERIMENTS

ON THE

ELASTICITY, DIRECT COHESION, AND COMPARATIVE STRENGTH.

WITH THE

CHARACTERISTICS AND USES,

OF SOME OF THE

INDIAN AND BURMAN TIMBERS.

"There is no branch of Economic Botany requiring the investigation of men of science more than the history of Timber trees; it is lamentable to see talented Botanists laboring over the definition of some species or variety possessing no other interest than the technical difficulties of its characters; whilst we are totally ignorant of even the names of the plants producing two-thirds of our most valuable Timber and furniture woods."—ARCHER'S ECON. BOTANY.

[illegible] Acacia [illegible] Mimosa [illegible] Rox. [illegible]

4. *Characters and uses.*—[illegible] is found in [illegible] the forests of Southern India, [illegible] on the eastern side and Mysore, growing [illegible] feet in height, with a trunk from 3 to 5 feet in girt; the branches are unarmed; leaves bipinnated with yellowish white globose flowers; legumes flat and thin. The wood is strong, fibrous and stiff, close grained, hard and durable, of a dark brown colour, superior to Saul and Teak in transverse strength, and direct cohesive power. *Uses.*—The wood is used for beams of native houses, and in the construction of carts; the wood of the crooked branches are used for ploughs by the ryots; the leaves are used by the natives for washing their hair.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
2	Acacia, Arabica. Mimosa, Arabica.	Willd. Lam.	Leguminosæ.	Baubool................. ....*Eng.* Kurroo valum...... ....*Tam.* Kurroo vaylum...... ....*Mal.* Nulla tooma.......... ....*Tel.* Kali keekur... ....*Duk.* Babul.....................*Hind.* Babula........ ... .*Beng.*	·864	54	4,186	16,815	884	·0095

2. *Characteristics and uses.*—This tree is common all over India, growing in any soil, in water, or in dry waste places, attaining to 30 or 40 feet in height, and seldom exceeding 4 feet in girt; bearing small bright yellow globose flowers, and bipinnated leaves. The wood is close grained and tough, of a pale red colour inclining to brown. *Uses.*—The wood is preferred for naves, spokes and felloes of wheels; but it must be seasoned in water after it is felled, to exempt it from the attack of insects. The tree also yields a transparent gum, which is used as a substitute for gum Arabic, the bark is extensively used in tanning, and the legumes are eaten by sheep and goats when grass is scarce.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$.
3	Acacia elata.	Grah.	Leguminosæ.	Seet.............................*Bur.*	·624	39	2,926	9,518	695	·0140
	Mimosa elata.	Rox.		Tella-sopora... .... *Tel.*						

3. *Characteristics and uses.*—This tree grows to a lofty height, logs from 20 to 30 feet in length, and from 5 to 6 feet in girt, are said to be had in the Burman jungles; the timber is light and easily worked, tolerably close and straight grained, of reddish brown color, inferior to Teak in transverse strength, direct cohesive power, and stiffness; from its color, texture, and lightness, I believe it will answer for cabinet-making purposes.

[illegible] nia.	[illegible] Rox.	Leg.	Woanee………… ……… Seet-net………… …… …… Bur.	[illegible]

4. *Characteristics and uses.*—The tree is common to India and Burmah, logs from 20 to 25 feet in length and 4½ feet in mean girt, are said to be procurable in the Burman jungles. The tree is armed with conical stipulary thorns, bark greenish white; leaves bipinnated, glabrous; pinnæ 3 to 6 pairs, with 10 to 20 pairs of oblong linear leaflets; flowers small, pale yellow, in auxiliary spikes; legumes flat, lanceolate, rusty colored. The wood is heavy and durable; in its unseasoned state, a cubic foot averages from 65 to 70 lbs., it does not warp nor crack; the grain rather coarse and even of a reddish brown color, marked with irregular streaks of a darker hue; it works kindly and gives a smooth surface. *Uses.*—It is used in the construction of country carts, and posts for native houses. The bark mixed with jaggery is used by the natives in distilling the country or Pariah Arrack.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
5	Acacia leucophlaea............ Mimosa luecophlaea......... Mimosa alba. ...	Willd. Rox. Rottl.	Leguminosæ.	White bark acacia... ... ... Panicled acacia.... ...... Velvaylum...... .... Tella-tooma........................ Kikar.....	*Eng.* *Tam.* *Tel.* *Hind.*	·880	55	4,086	16,288	861	·0097

5. *Characteristics and uses.*—The tree grows from 20 to 30 feet in height, and from 3 to 4 feet in girt, with armed branches; leaves bipinnated; pinnæ from 7 to 12 pairs, with numerous oblong, linear leaflets; flowers pale yellow in terminal spikes; legumes long, narrow and curved. The timber is hard and strong, like that of Baubool, but it is closer grained, and of deeper colour. *Uses.*—It is used for the same purposes as the Baubool; in its unseasoned state a cubic foot weighs 62 lbs., the tree is valued by the natives of the South more for its bark, from its being used like that of *Acacia ferruginia* in the distillation of the country liquor called Pariah Arrack.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $L_1 = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
6	Acacia odoratissima......... Acacia lomatocarpa............ Mimosa odoratissima............. Mimosa marginata...........	Willd. D. C. Lin. Lam.	Leguminosæ.	Kurroo-vangay... ... . Telsoo............................. Shella............................... Kurroo-vangay... ... ... Kurroo-vinge...... ... . Shella-vinge...	*Eng.* *Tel.* *Tam.* *Mal.*	·736	46	3,608	16,070	800	·0111

6. *Characteristics and uses.*—The tree grows from 40 to 50 feet in height, and from 5 to 6 feet in girt, it is found both in the Indian and Burman jungles; leaves bipinnated; leaflets narrow, oval, oblique, glabrous, and pale, on the underside; flowers pale yellow with monodelphous stamens, and very fragrant; legumes flat, thin and thick margined. The wood is hard and coarse grained, heavier than Teak, and equal to it in strength, it is of a dark reddish brown, or of a dark brown colour, with white coloured sap-wood. *Uses.*—It is used by wheel-wrights for naves and felloes of wheels; also for cabinet-making purposes, and railway sleepers.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 S}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2 S}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 S}{L^3 p}$
7	Acacia serissa.	Buch.	Leguminosæ.	Serissa..............	*Eng.*	·800	50	3,502	173	793	·0114
	Acacia speciosa.	Willd.		Katoovaugi...	*Tam.*						
	Mimosa speciosa.	Jacq.		Dirisana...............	*Tel.*						
	Mimosa serissa.	Rox.		Serissa.......................... ...	*Beng.*						
	Mimosa flexuosa.	Rottl.		Seet......................	*Bur.*						
				Vauga............	*Mal.*						
				Vel-vauga......	*do.*						

7. *Characteristics and uses.*—The tree is common to both India and Burmah, growing from 40 to 50 feet in height, and from 5 to 6 feet in girt; the leaves are bipinnate; flowers fragrant, greenish white, changing to pink as it fades, with long monodelphous stamens; legumes flat and thin; flowers in May and June, and yields a transparent gum. The wood is hard and durable, never warps nor cracks, nearly equal to the Teak in strength, of a light reddish brown color, striped with darker colored veins. *Uses.*—It is used by the natives for a variety of purposes, but chiefly for naves of wheels, pestles and mortars.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3}{L^3 p}$
8	Acacia species.		Leguminosæ.	Kokoh........................ *Bur.* Poomah........................ *Kar.* Syethan........................ *Tal.*	·7[illegible]6	46	4,123	19,263	855	·0097

8. *Characteristics and uses.*—Specimens of this wood were sent by Captain Benson from the Tenasserim Provinces, where, he says, it grows from 5 to 6 feet in mean girt. According to Dr. Brandis, in his " List of Specimens of some of the woods of British Burmah, the length of the trunk up to the first branch is 60 feet, and the girt at 6 feet, from the ground is 12 feet." The wood is nearly of the same texture as that of "*Acacia serissa*" but darker in colour. *Uses.*—Dr. Brandis states " that the wood is used by the Burmese for cart wheels, oil presses, and canoes: and " that it is valued by them as much as Peddowk or even more so."

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
9	Acacia stipulata. Mimosa stipulata.	DeC. Rox.	Leguminosæ.	Stipulated acacia......... ... *Eng.* Amlooki......................... *Beng.* Seet................. .... *Burm.*	·880	55	4,474	21,416	823	·0089

9. *Characteristics and uses.*—This tree is said to be "one of the largest of the genus," growing from 40 to 50 feet in height, and from 5 to 6 feet in girt; leaves bipinnated; flowers globose, white or rose-coloured; legumes thin, flat, and glabrous. The wood is strong, compact, and stiff, coarse-grained and fibrous, of a light reddish brown colour, its direct cohesive power is superior to its transverse strength; weight of a cubic foot in its unseasoned state is from 63 to 65 lbs. *Uses.*—It will make an excellent house-building timber, and naves of wheels.

[illegible]

10. *Characteristics and uses.*—The tree is said by the natives to be the male of the Currengally (*Acacia Sundra*), and is called by the same name in Tamil; it is found all over India, and according to Lieutenant Beddome's report on the Godavery and Circar Forests, " it is abundant in the Aukeesah jungles," growing from 20 to 30 feet in height, and from 3 to 4 feet in girt; leaves bipinnate; flowers small, white during the rainy season. The wood is close grained, hard and durable, of a cinnamon brown colour, works smoothly and stands a good polish. A very superior wood in direct cohesive power, the weight of a cubic foot of unseasoned wood averages from 85 to 90 lbs. *Uses.*—It is used by the natives in house-building, and in the construction of carts: chips of the wood boiled in water, yield a dark purple dye, like that of *Acacia catechu.*

[illegible] *Characters and uses.*—The wood of this tree is darker-coloured and heavier than that of *Acacia Suma*, growing from [illegible] to [illegible] feet in height, and [illegible] to [illegible] feet in girth, with armed branches; leaves compound, with small linear leaflets; flowers small, yellow; legume thin, flat, and lanceolate. It is abundant in the [illegible] jungles. The wood is hard and stiff, tolerably close grained and durable, of a dark red colour, and marked irregularly with stripes of a darker shade. A cubic foot of unseasoned wood weighs from 94 to 98 lbs. *Uses.*—It is used for beams and posts for native houses, mortars, and pestles. I think it is an excellent wood for piles and Railway sleepers; chips of this wood boiled in water also produce a dark purple dye.

Legum

Manjotie.................... *Mal.*
Koochunduna............... *Hind.*
Y-wai-gyee........ .... *Burm.*

12. *Characteristics and uses.*—The wood of this tree when fresh cut, resembles the red Sanders, and although it is not so highly fragrant, it is more agreeable; the tree grows to such a size as to yield logs from 18 to 20 feet in length, and from 5 to 6 feet in girt; the leaves are bipinnated, with oval obtuse leaflets; flower small, yellow and white mixed, fragrant; legumes twisted, containing shining scarlet seeds. It is found in all parts of India, and chiefly in the Annamallai Forest, it also grows in Burmah. The wood is strong, but not stiff; it is hard and durable, tolerably close and even-grained, and stands a good polish: when fresh cut, it is of a beautiful coral red colour, and sometimes marked with stripes of a darker shade; after exposure it turns purple, resembling Rosewood. A cubic foot of unseasoned wood weighs 62 lbs. *Uses.*—It is used for Cabinet-making purposes and in house-building, it is also used in the same way as Sandalwood by Bramins and other respectable Hindoos, and the seeds are used as weights by jewellers.

[illegible]

[illegible] Circars, it grows from 25 to 30 feet in height, and from $2\frac{1}{2}$ to 3 feet in gi[illegible] a long sudden accumination, velvety beneath; flowers purple; fruit size, of a plum and of a purple colour, containing sweetish mucilaginous juice, eaten by the natives; the wood is strong, very close, and even-grained, of a dark brown colour, easily worked, and gives a smooth glossy surface. The Sapwood, which is of a white colour, is also very close and even-grained, and nearly as strong as the heart. A cubic foot of unseasoned wood weighs from 55 to 60 lbs. *Uses.*—The wood from its close and even-grain is well suited for ornamental works; and in Mr. R. M. Macdonald's Report on the Ganjam and Goomsoor woods it is stated, "The leading bull in a herd of buffaloes has a sort of wooden bell called "Lodoko" attached to its neck, this is heard at a great distance in the jungles, and is always made of this wood, which is said to be peculiarly adapted for producing sounds."

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
14	Anona reticulata.	D. C.	Anonaceæ.	Bulls-heart................ Ram-seetha................ Ram-phul..................	*Eng*... *Tam*.. *Hind*..	·640	40	2,901	14,702	640	·0137

14. *Characteristics and uses.*—This is more a fruit than a timber tree, growing from 15 to 20 feet in height, and from 3 to 4 feet in girt, with entire, oblong, lanceolate leaves, and yellowish green flowers of a strong vinous smell; the tree is common to India, and it is cultivated for its fruit, which is eaten both by Europeans and Natives, but not much esteemed. The wood is light and tough, easily worked, rather close grained, of a reddish brown colour. A cubic foot of unseasoned wood weighs from 45 to 50 lbs. *Uses.*—I have not known the wood to be used for any particular purpose, but it appears to be well suited for light furniture.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S \frac{40 b d^3 \delta}{L^3 p}$
15	Artocarpus eschinatus... ...	Rox.	Artocarpaceæ.	Mountain Jack............ *Eng*... Tampinoo.................. *May*... Tong Peingnai... .... *Burm.*	1·008	63	3,318	15,070	672	·0120

15. *Characteristics and uses.*—This is a fruit tree, and specimens of the wood were sent from Penang; it is said to abound in the Islands of the Eastern Archipelago, and in the Tenasserim Provinces; the wood of the latter place is of an inferior quality; logs from 20 to 30 feet in length and from 5 to 6 feet in girt are said to be procurable; the wood, which is of a reddish yellow colour, is hard, heavy, and durable, tolerably close grained and even, works kindly and stands a good polish; it is equal to the Angelee wood in direct cohesive power, but inferior in transverse strength. A cubic foot of unseasoned wood weighs from 68 to 72 lbs. *Uses.*—It is used for Cabinet-making purposes, for which it is well adapted.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^2 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L. W.}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
16	Artocarpus hirsuta. ...	Lam.	Artocarpaceæ.	Angelee.................... *Eng*... Angelee.................... *Tam*... Ayenee.................... *Mal*... Helbulsoo.................... *Can*... Thounben.................... *Burm*. Del.................... *Cey* ... Pat-phunus.................... *Mah*...	·604	40	3,905	15,070	744	·0102

16. *Characteristics and uses.*—This tree attains to a large size in the Travancore jungles of Malabar; leaves elliptic, obtuse, glabrous above, and hairy beneath; flowers monœcious; fruit globose; the wood is strong and tolerably close and even-grained, of a glossy texture, and of a light yellowish brown colour. It is abundant in the forests of Southern India, Godavery, and Burmah; logs from 15 to 22 feet in length, and from 4 to 5 in girt have been received in the Gun Carriage Manufactory. A cubic foot of unseasoned wood weighs from 48 to 50 lbs. *Uses.*—The wood is used for house and ship-building, and also for furniture. The fruit, which measures from 6 to 8 inches in diameter, is eaten by the natives.

[illegible]

large size, from 30 to 40 feet in height, and from 4 to 5 feet in girt; leaves entire, alternate, ovate, oblong; flowers monœcious, small—male white, female greenish, on an amentacious receptacle, in January and February; fruit large, ovate, muricated, growing either on the branches, trunk, or roots, according to the age of the tree. The tree is of a rapid growth, thrives well in sandy soil, but the wood is inferior to that which grows in stiffer soil; it yields an excellent timber, at first yellow, fading to brown, hard and brittle, resembling satin: warps, if not properly seasoned. A cubic foot of unseasoned wood weighs 50 lbs. *Uses.*—The wood is extensively used in the Southern parts and Ceylon for furniture and house-building. The fruit is esteemed, and forms an article of diet to the natives of the South.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
18	Averrhoa carambola.. ...	Linn.	Oxalidaceæ.	Carambola.................... *Eng*... Thumurthum .... *Tam*... Kamaranga.......... ... *Mal*... Kumurunga.......... ... *Beng*.. Meetha-kamaranga... ... *Duk*... Zoung-ya.......... .... *Burm*.	·640	40	3,905	13,116	712	·0102

18. *Characteristics and uses.*—This tree is cultivated in gardens for the sake of its fruit, it grows from 20 to 30 feet in height, and 3 to 4 feet in girt, with alternate, unequally pinnated leaves, and ovate leaflets; flowers yellowish purple, in short racemes; fruit acutely angled, containing an acid juicy pulp. The wood is of a close even grain, and of a reddish brown color. A cubic foot of unseasoned wood weighs from 48 to 50 lbs. *Uses.*—I have not seen the wood used for any purpose. The fruit is either pickled, or preserved in sugar, and sometimes used by the natives in their curries.

[illegible]

ripe, pulp sweetish. The wood is hard, fibrous and durable, of a reddish-brown color, slightly bitter, and fragrant, exempt from the attack of insects. A cubic foot of unseasoned wood weighs from 55 to 60 lbs. *Uses.*—The wood is used for furniture and ship-building in some parts of India; the leaves are eaten by the Burmese as a pot-herb; from the seeds a bitter greenish oil is expressed, used by the natives against vermin, and taken internally against worms; the bark is used as a good substitute for Peruvian bark. In old trees the juice is extracted by making an incision at the roots, and drunk by the natives as a cooling beverage during the hot season.

cineum	... D. C.	[illegible]	Hedjul........................	Beng.
Engenia acutangula	... Linn...		Eedjul........................	Hind.
Engenia racemosa	Rox ...			
Meteorus coccineus.	Lour...			

20. *Characteristics and uses.*—The tree is common to India and Burmah, growing to a large size, from 20 to 30 feet in height, and from 3 to 4 feet in girt, with entire, cuneate, obovate leaves; flowers small, reddish white, with scarlet filaments, in long pendulous racemes; fruit oblong, four-sided, and sharp-angled. The wood is of a beautiful red color, tough and strong, and stands a good polish. A cubic foot of unseasoned wood weighs from 65 to 70 lbs. *Uses.*—The wood of this tree is in great request by Cabinet makers; the native workmen in Madras call it Munneelahaucha-murrum from its susceptibility of turning black when buried in mud; it appears to be identical with that of "Syndesmus Tavoyana," specimens of which were sent by Captain Benson from the Tenasserim Provinces.

[illegible]

[illegible] of India, and has a showy appearance when in blossom; the flowers are [illegible] pendulous racemes; the leaves are entire, alternate, cuneate, oblong; and the fruit ovate, bluntly four angled, brownish when ripe; it grows to the same size, and the wood is lighter colored than Barringtonia acutangula, it is also closer grained, of less specific gravity, and nearly as strong; it works kindly, and gives a smooth even surface. A cubic foot of unseasoned wood weighs from 60 to 65 lbs. *Uses.*—It is used by the natives for house-building, cart-framing, and recently tried for Railway sleepers.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W.}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
22	Bassia latifolia.	Rox.	Sapotaceæ.	Mahwah............ ...... *Eng*... Caat-eloopei.............. *Tam*... Ippie...................... *Tel*... Poounum.................... *do.* Moola...................... *Hind.* Mahwah............ .... *Beng.*	1·056	66	3,420	20,070	760	·0118

22. *Characteristics and uses.*—The tree grows from 40 to 50 feet in height, and from 8 to 12 feet in girt; leaves alternate, oblong, and elliptic; flowers white, with thick fleshy corolla, sweet taste, and of a disagreeable smell. The timber is hard, strong, and durable, not easily worked, close and even-grained, of a reddish brown color, and tasting bitter. A cubic foot of unseasoned wood weighs from 77 to 80 lbs. *Uses.*—The wood is used for framing and panelling of doors, windows, and furniture, and in the construction of country vessels; the flowers are eaten by the natives, and a strong spirit is distilled from it, and a concrete oil is expressed from the seeds.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific Gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
23	Bassia longifolia.	Linn.	Sapotaceæ.	Bassia........................ *Eng.* Elloopei........................ *Tam.* Ippie.................................. *Tel.* Mee.................................. *Cey.* Mohe............................ *Hind.*	·960	60	3,174	15,070	730	·0127

23. *Characteristics and uses.*—This is a common tree in Central and Southern India, cultivated for the sake of its oil, forming extensive topes and sometimes planted in gardens; the ground about the tree is much infested with sand-bugs; it grows from 40 to 50 feet in height, and from 4 to 6 feet in girt; leaves lanceolate, entire; flowers white, of a sweet taste and disagreeable smell; fruit olive-shaped, yellowish when ripe, containing one or two seeds. The wood is heavy, close, and straight-grained, very flexible and durable, a little inferior to Teak in strength, of a yellowish brown color, having a bitterish taste, and exempt from the attack of insects. A cubic foot of unseasoned wood weighs from 70 to 75 lbs. *Uses.*—The wood is used in the construction of country carts and furniture; the flowers and fruit are eaten by the natives; oil is extracted from the seeds and has the consistency of ghee, and is used by the village people for various purposes.

[illegible]

24. *Characteristics and uses.*—This tree like the rest of the species is noted for its flowers; it is generally planted on the side of garden walls or hedges, growing from 20 to 25 feet in height, and from 3 to 4 feet in girt; during the rainy season or immediately after it, the tree is covered with large rose-coloured fragrant flowers; the leaves are roundish, cordate at the base; leaflets oval, obtuse; legumes straight. The wood is of a light yellowish-brown color, coarse-grained, flexible and light. A cubic foot of unseasoned wood weighs from 45 to 48 lbs. *Uses.*—The wood is used by the ryots in the villages for a variety of purposes.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
25	Bignonia chelonoides ... Spathodea longiflora ... Bignonia longiflora ...	Linn. Vent. Willd.	Bignoniaceæ.	Padrie..................... .... *Eng.* Padrie............................... *Tam.* Kalighootroo...... .... *Tel.* Ponpadera......... ... . *Mal.*	·768	48	2,804	16,657	642	·0146

25. *Characteristics and uses.*—The tree is said to be plentiful in the Annamalai jungles, growing to a large size, from 40 to 50 feet in height, and from 4 to 6 feet in girt; leaves impari-pinnate, with oblong leaflets; flowers large, orange colored, tinged brown, fragrant, in terminal panicles. The wood is of a beautiful orange-yellow color, close and even-grained, elastic and durable, easily worked, and gives a smooth glossy surface. The sapwood is rather coarse-grained, of a brownish white color, not durable. A cubic foot of unseasoned wood weighs from 57 to 60 lbs. *Uses.*—The wood is used in house-building, and for Railway sleepers; the flowers are used by the Hindoos in their devotions.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
26	Bignonia stipulata...	Rox.	Bignoniaceæ.	Pethan........................ *Eng.*	1·024	64	5,033	28,998	1,386	·0080
	Spathodea stipulata...	Wall.		Pethan.............. ...... *Burm.*						

26. *Characteristics and uses.*—This tree is said to be plentiful in Tavoy, Mergui, and Pegu, logs from 4 to 5 feet in girt, and from 18 to 20 feet in length are procurable; the wood resembles good Teak in color and texture; it is very strong, fibrous and elastic, and a very superior wood for sustaining cross-strain. A cubic foot of unseasoned wood weighs from 72 to 75 lbs. *Uses.*—The wood is used by the Burmese chiefly for house-building, also for bows and spear handles.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
27	Bignonia suberosa. .... Millingtonia hortensis.	Rox. Linn.	Bignoniaceæ .	Indian Cork tree........... *Eng.* CaatMullee.................. *Tam.*	·672	42	3,293	11,104	610	·0121

27. *Characteristics and uses.*—It is called the Indian Cork tree, from its having a thick corky bark; it grows from 30 to 40 feet in height and from 3½ to 4 feet in girt; its leaves are opposite, supra-decompound, with entire accuminated, sub-cordate leaflets, and during the rainy season its dark-green foliage is crowned with large snow-white fragrant blossoms; as an ornamental tree it is planted in gardens. The wood is hard and close-grained, of a pale yellow color, not easily-worked; it is flexible, but not fibrous. A cubic foot of unseasoned wood weighs from 50 to 52 lbs. *Uses.*—I have not seen the wood used for any purpose: it is well suited for furniture and ornamental works.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
28	Berrya ammonilla	Rox.	Tellaceæ.	Trincomallee................. Thrinnah murrum.......... Halmilile....................... Sarala devaden...	*Eng.* *Tam.* *Cey.* *Tel.*	·800	50	3,836	26,704	784	·0104

28. *Characteristics and uses.*—This wood is annually imported from the Island of Ceylon, in logs from 18 to 25 feet in length, and from 2½ to 5 feet in girt; it is strong, tolerably light, flexible, and straight-grained, easily worked, of a pale red color, fading to light brown; it is a superior wood for direct cohesive strength. A cubic foo of unseasoned wood weighs from 58 to 60 lbs. *Uses.*—The wood is used for shafts, poles, spokes of wheels, and framing of carriages, handles, and helves, and answers all the purposes that Ash does in England.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
29	Briedelia spinosa.	Willd.	Euphorbiaceæ.	Mooloovengay..................	*Tam.*	·960	60	4,132	14,801	892	·0097
				Koraman.................... ..	*Tel.*						
	Cluytia spinosa. .	Rox.		Mooloovangay....	*Mal.*						
				Sun.........................	*Duk.*						

29. *Characteristics and uses.*—The tree grows from 30 to 40 feet in height, and from 6 to 7 feet in girt; it is plentiful in the forests of Central and Southern India; the bark scabrous; branches numerous and spreading, armed with few large thorns; leaves entire, oblong, and pointed, with conspicuous parallel veins running from centre to circumference; flowers small, greenish-yellow in axillary or terminal spikes, from July to October. The wood, which is of a dirty red or copper color, is very stiff and strong, close-grained, heavy, and durable, not easily worked. A cubic foot of unseasoned wood weighs from 68 to 70 lbs. *Uses.*—The wood is used for Railway sleepers, and by the Natives in the construction of carts.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
30	Borassus flabelliformus... ... ... Lontarus domestica.	Linn. Rumph	Palmacæ.	Palmyrah........ .... *Eng.* Pannie murrum... ... . *Tam.* Thattee chettoo...... ...... *Tel.* Panna........... .... *Mal.* Thadkah jad......... ... *Hind.* Tal.............. .... *Cey.* Htan.......................... *Burm.*	1·040	65	4,904	11,898	944	·0081

30. *Characteristics and uses.*—The tree grows from 40 to 50 feet in height, and from 4 to 6 feet in girt at the foot, tapering from 1 to 2 feet at the top; the whole trunk is marked, with old cicatrices of fallen leaves; fronds composed of several linear lanceolate divisions, united as far as the centre; flowers male and female on different trees; fruit spheroidal. Good Palmyrah wood is one of the strongest to sustain cross strain, and durable; the timber received in Madras for the last four or five years, is of an inferior quality, containing much sapwood. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—It is one of the most useful trees of Southern India; every part is turned to some account by the natives; its chief value is in the vinous juice it yields, called "Toddy;" if the juice is allowed to ferment, it has an intoxicating effect, the same is converted into vinegar; if the juice is extracted for the manufacture of sugar, the inner surface of the vessels, which receive the juice from the tree, is rubbed with chunam, to prevent fermentation, it is then called "Pannung char." The timber is used in house-building: the leaves are used for covering houses, and for writing on; the oldest Hindoo Records are of these leaves; rope is made from the fibres of the petioles; the ovule called "Noongoo" is eaten; the fruit contains from two to three seeds. When ripe, it is covered with sweet pulpy matter, and is eaten either roasted or boiled; the hard integument of the seeds is converted into small household utensils; and the root

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31	Byttneriæ species.		Byttneriaceæ.	Pawoon.................... *Eng...* Pawoon...... .... *Burm.*	1·017	63	4,284	26,571	1,012	·0093

31. *Characteristics and uses.*—This tree is said to be abundant in the Tenasserim Provinces; logs from 20 to 30 feet in length, and from 5 to 8 feet in girt, are to be had; the timber is strong, fibrous, and elastic, close and even-grained, and therefore susceptible of a fine polish, of a reddish-brown color; it is superior in direct cohesive power to Teak or Saulwood, and nearly equal to Trincomallee. A cubic foot of unseasoned wood weighs from 73 to 77 lbs. *Uses.*—Used by the Burmese for wooden axles, poles of carts and spear handles.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$.
32	Cæsalpina coraria.	Willd.	Leguminosæ.	American sumach......... *Eng*...	·896	56	4,045	19,178	724	·0098
	Poinciana coraria.	Jacq.		Divi-divi.................... *Tam*...						

32. *Characteristics and uses.*—The tree is said to have been introduced into India by Dr. Wallich, it is cultivated in gardens, growing from 25 to 30 feet in height, and from 2 to 3 feet in girt; leaves bipinnated; pinnæ from 6 to 7 pairs with 15 to 20 pairs of linear, obtuse leaflets; flowers small, greenish-yellow, and very fragrant, in panicled racemes; legumes oblong, recurved laterally. The wood is very hard, close-grained and heavy, of a brown color, not easily worked, and of a slightly bitter taste. The sapwood also is very hard and strong, close, but not even-grained. A cubic foot of unseasoned wood weighs from 72 to 78 lbs. *Uses.*—The wood is not known to be used for any purpose, but from the fineness of its grain, it is suited for ornamental work. The pods, for which the tree is cultivated, is extensively used in tanning.

33. *Characteristics and uses.*—The wood of this tree is esteemed as a valuable dye-wood; the tree is common in the jungles of Central and Southern India, chiefly in those of Tripathy and Palghaut, from whence it is brought in billets, and exported to Europe and China: it grows from 30 to 40 feet in height, and from 2 to 3 feet in girt, with armed branches and bipinnated leaves; pinnæ from 10 to 12 pairs, with 10 to 12 pairs of obliquely oval, oblong emarginate leaflets, pale on the underside; flowers in yellow terminal panicles; legumes compressed, glabrous, elliptic obovate, obliquely truncated, cuspidate at the apex. The wood is strong, close, and even-grained, and very fibrous, of a beautiful deep orange-red or flame color; it works easily, with a smooth glossy surface, and is susceptible of a high polish; it does not warp nor crack. A cubic foot of unseasoned wood weighs from 72 to 75 lbs. *Uses.*—The wood is extensively used in dyeing and in turning ornamental works.

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34	Calophyllum Burmanni...	Wht.	Gutiferæ.	Poon...................... ..... *Eng.* Poona............................ *Mal.* Pinnay.......................... *Tam.* Ponna.............................. *Tel.* Therapee...... .... *Burm.* Seráya............................ *Maly.*	·720	45	2,944	15,864	612	·0135

34. *Characteristics and uses.*—Specimens of the wood were sent to the Gun Carriage Manufactory from Burmah by Captain Benson; he states that it is abundant in the Burman forests, growing from 5 to 7½ feet in girt; it is also found in the forests of Southern India, and the Eastern Islands, where, according to the accounts of the late Captain Best, of the Madras Engineers, " the Syráya or Poon is the most abundant wood in Singapore. The best sort of Poon is grown on the hills, and called Syráya. It is distinguished by white thread running lengthwise, it grows to 100 and 130 feet long, squaring 3 feet at the but. It is easy to saw and work up ; used for all building purposes, and not capable of enduring moisture for a long period." The wood is nearly as strong as Teak, nails driven into it are not easily extracted, the grains are coarse and glossy, and the color brown; there is also a lighter colored variety, which is tougher wood and of less specific gravity. The weight of a cubic foot of seasoned wood averages from 40 to 50 lbs., and in its unseasoned state averages from 50 to 60 lbs. *Uses.*—The wood is used for ship, and all purposes of house-building.

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35	Calophyllum longifolium.		Guttiferæ.	Red Poon.................. *Eng.* Pinnay.................. *Tam.* Ponna.................. *Mal.* Pona.................. *Tel.* Tharabee.................. *Bur.* Seráya.................. *Maly.*	·720	45	3,491	16,388	546	·0121

35. *Characteristics and uses.*—A log of this wood was found in an allotment of Peemah 25 feet in length and 5 feet in mean girt; it appeared to be the but-end of a large log that was cross-cut. The wood is tougher than Calophyllum Burmanni, and with the exception of the color in other respects it possesses the same characteristics; when fresh cut it is of a beautiful red, and eventually fades to a reddish-brown color. A cubic foot of unseasoned wood weighs from 50 to 60 lbs. *Uses.*—The wood is used in house and ship-building; in Madras it is also used for furniture, and it is one of the many that are passed by the natives for Chittagong wood; if it is well dressed and polished, it is superior to the latter wood in appearance, strength, and durability.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

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36	Calophyllum spurium.... ... ... Calophyllum calaboides. ... ... Calophyllum apetalum.... ... ... Calophyllum calaba...............	Choisy. G. Don. Willd. Linn.	Guttiferæ.	Shoray Pinnay.............. *Tam.* Bubbee mura... .... *Can.*	·624	39	1,855	11,898	567	·0125

36. *Characteristics and uses.*—The timber is generally imported to Madras from the Western Coast, in planks from 20 to 30 feet in length, 10 to 12 inches in breadth, and from 1½ to 2 inches thick; the tree grows in the forests of Canara and Malabar; it is a tough, light, coarse-grained wood, of a whitish brown color. A cubic foot of unseasoned wood weighs from 45 to 48 lbs. *Uses.*—The wood is used by Cabinet-makers for the inside lining of furniture, and light travelling trunks; it is also used by the natives on the Western Coast for making canoes.

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37	Carallia integerrima..............	D.C.		Maneoga........ .... *Eng.*	·684	44	2,876	15,070	656	·0139
	Carallia lucida...	Rox.		Maneoga.................... *Burm.*						
	Carallia integrifolia..	Grah.		Keerpa........................ *Beng.*						

37. *Characteristics and uses.*—The tree is said to be abundant in the Tenasserim and Martaban Provinces; logs from 18 to 30 feet in length and from 4 to 6 feet in girt are procurable; the timber is tough, and not easily worked; very brittle and not durable, of a light brown color, and a pretty wavy appearance; the structure of the wood is peculiar to that of other woods of the same class, having a great deal of cellular tissue, interspersed between the woody layers, in the direction of the medullary rays. A cubic foot of unseasoned wood weighs from 50 to 60 lbs. *Uses.*—The wood is used by the Burmese for boards and rice pounders; and from its handsome appearance, it is well adapted for Cabinet and ornamental purposes.

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38	Careya arboria...	Rox.	Barringtoniaceæ.	Bamboi.............. ...... *Burm.* Pailæ............. . ... *Tam.* Peloa...... .... *Mal.* Buda darmee............... ... *Tel.*	·800	50	3,255	14,803	870	·0122

38. *Characteristics and uses.*—The tree grows to a large size, and is common to both Peninsulas of India; leaves oval, serulate, dentate; flowers large, greenish-white, in March and April; fruit oval, of an unpleasant smell; the bark furnishes coarse cordage. Logs from 15 to 25 feet in length, and from 4 to 5 feet in mean girt, are received from Burmah; the wood is tough, strong and durable, close and even-grained, but inferior to Teak in its direct cohesive strength; admits of a fine polish, red colored, resembling Mahogany. A cubic foot of unseasoned wood weighs from 60 to 63 lbs. *Uses.*—The wood is used by the Burmese for posts of houses and cart-framing; from its color and texture it is an excellent wood for furniture; cordage manufactured from the bark is used in India as slow match, by matchlock men.

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39	Cassia sumatrana Cassia florida. ...	Rox. Vahl.	Leguminosæ.	Sumatra cassia............... *Eng.* Arremene..................... *Cyn.* Mayalee...................... *Burm.* Munjah Konnay............ *Tam.*	·928	58	2,720	14,285	840	·0147

39. *Characteristics and uses.*—The tree, with its pyramidal head and the branches, terminating in large panicles of gold-colored flowers, adds not a little to the appearance of the gardens in Madras during the months of November and December, and while it grows to a moderate size in Madras (from 20 to 25 feet in height, and from 2 to 3 feet in girt) it is said to attain a larger size in the Burman country; and according to Captain Dance's Report, logs having a "maximum girt of 4 cubits and 30 feet in length" are procurable. The leaves are equally pinnated with 8 to 10 pairs of oblong leaflets; legumes flat, narrow, and slightly curved, containing from 8 to 10 seeds. The wood is of a yellowish brown color, sometimes beautifully marked with irregular black streaks, it is close-grained, hard and durable, but not stiff; it works kindly with a smooth surface, and stands a good polish. A cubic foot of unseasoned wood weighs from 68 to 70 lbs. *Uses.*—The wood is little known in Madras; judging from the texture and appearance of the wood, it is well adapted for furniture: the Burmese use it for mallets, walking sticks, and helves.

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40	Castanea Indica..	Rox.	Quercaceæ.	Theet Khaya.............. ... *Burm.*	·560	35	2,652	11,104	404	·0150

40. *Characteristics and uses.*—This wood possesses no strength whatever as a building material, being inferior in transverse strength and direct cohesive power; it is very light and soft, the grains are close, even, and straight, of a whitish brown color, and easily worked. Specimens of this wood, with those of *Castanea Martabanica* were sent to the Gun Carriage Manufactory from Burmah by Captain Benson, who states, the tree grows from 3 to 5 feet in girt, and recommends it as a good substitute for Deal. A cubic foot of unseasoned wood weighs from 40 to 45 lbs. *Uses.*—From the lightness of the wood and the fineness of its grain, I think it is well adapted for light fancy articles, camel trunks, and packing cases.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
41	Castanea Martabanica.	Wall.	Quercaceæ.	Entha or Zetha... ...... *Burm*...	·640	40	2,652	18,243	762	·0150

41. *Characteristics and uses.*—The wood is nearly similar in appearance to *Castanea Indica,* but superior to it in strength, it is also a tougher and harder wood, but not so close in the grain; the tree is said by Captain Benson to grow from 3 to 6 feet in girt. A cubic foot of unseasoned wood weighs from 48 to 50 lbs. *Uses.*—From the strength and hardness of the wood, I think it could be used in the framing of doors and windows, and in the construction of carts.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timber.

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42	Casurina muricata. ... Casurina equisetifolia. ...	Rox. Linn.	Casuminaceæ.	Casurina..................... *Eng.* Chowk murrum............ *Tam.* Serva chettoo............... *Tel.*	·880	55	4,474	20,887	920	·0089

42. *Characteristics and uses.*—This tree is said to be introduced about 50 or 60 years ago from Chittagong; it is now common about Madras and other parts of Southern India, growing from 40 to 50 feet in height, and from 2 to 4 feet in girt; leaves verticelled, slightly furrowed, jointed; flowers minute, greenish in February and March. It yields a strong, fibrous and stiff timber, of a light reddish-brown color, resembling Trincomallee, but a little coarser in grain; it is superior to Trincomallee for sustaining cross strains, and nearly equal to it in direct cohesive strength. A cubic foot of unseasoned wood weighs from 63 to 68 lbs.

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43	Cathartocarpus fistula. ... Cassia fistula. ... Cathartocarpus rhombifolia. ...	Pers. Linn. Rox.	Leguminosæ.	Locust........................ *Eng.* Surra Konnay................ *Tam.* Kaki.............................. *Can.* Bawa....................... ... *Mah.* Soonaree....................... *Beng.* Gnoo-shweay.............. *Burm.*	·976	61	3,153	17,705	846	·0129

43. *Characteristics and uses.*—This is an ornamental tree found in gardens, it has a beautiful appearance when in blossom; in the plains it seldom attains a greater height than 30 or 35 feet, and from 8 to 10 feet up to the branches, with a girt of 2 to 3 feet; in the jungles it grows sufficiently large as to yield spars for native vessels, it is found both in India and Burmah; leaves pinnate, leaflets about 5 pairs, broadly ovate, obtuse or retuse, glabrous; flowers bright yellow, fragrant, in long pendulous terminal racemes from May to June; legumes cylindrical from 1 to 2 feet in length, with numerous cells, each containing an oval seed covered with black sweetish pulp. The wood is strong, elastic and durable, close and straight grained, of a dark brown color often beautifully mottled, and works kindly. A cubic foot of unseasoned wood weighs from 72 to 78 lbs. *Uses.*—The wood is used for ship-building, it is used by the Burmese for bows and wooden axles; it is also well suited for furniture work.

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44	Cathartocarpus Roxburgia. ... Cassia marginata. ... Cathartocarpus emarginatus.	D. C. Rox. G. Don.	Leguminosæ.	Knotted cassia.............. *Eng.* Seggapoo konnay .... *Tam.* Ngoo-thaing................. *Bur.*	1·008	63	3,625	23,881	880	·0110

44. *Characteristics and uses.*—This tree with its drooping branches, and the head draperied with rose-colored blossoms from the summit to the extremities, has a very beautiful appearance in a garden; it grows from 15 to 20 feet in height, the trunk with a deeply cracked bark, from 8 to 10 feet up to the branches, and from 3 to 4 feet in girt; the leaves are equally pinnated, with oblong leaflets, and legumes cylindrical. The wood is close-grained, hard and durable, works smoothly and stands a good polish, when fresh it is deep rose colored, but eventually turns reddish-brown. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—The wood is well adapted for articles of turnery, such as naves of wheels, and handles of instruments.

Number.	Genera.	Authority.	Order.	Synonyms..	Specific Gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
45	Cedrela toona ... Cedrela hexandra.	Rox. Wall.	Cedrelaceæ.	Indian Cedar... .... *Eng.* Toon... .... *Tam.* Thit-kado............. ...... *Burm.* Toona.................. ...... *Hind.*	·496	31	2,684	9,000	560	·0147

45. *Characteristics and uses.*—This is a valuable timber tree, growing to a large size; logs from 18 to 20 feet in length, and from 6 to 8 feet in mean girt were received into the Gun Carriage Manufactory from the Travancore forest, where it is abundant, it is also found in the Circars, and Burmah; leaves abruptly pinnate; leaflets ovate, lanceolate, accuminated; flowers small, white, in May; capsule oblong, five-celled dehiscent. The wood is not strong, but light, close-grained and beautifully veined, easily worked, and susceptible of a high polish; when sawn or broke, it emits an agreeable aroma. A cubic foot of unseasoned wood weighs from 36 to 40 lbs. *Uses.*—The wood is extensively used by cabinet-makers; this wood with that of Malay vaimboo *(Melia Azaderachta)* and other woods, are sold in Madras under the name of Chittagong.

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46	Chickrassia tabularis ... Swietenia chickrassa ... Plagiotaxis chickrassa. ...	Juss. Rox. Wall.	Cedrelaceæ.	Chittagong.................... *Eng.* Chickrassee..................*Beng.* Aglay.............................. *Tam.* Yimma............................ *Burm.*	·672	42	2,876	9,943	614	·0139

46. *Characteristics and uses.*—The wood, as the name implies, is supposed to be exported only from Chittagong, whereas it is found in many parts of India and Burmah; the tree attains a considerable size in the jungles, growing from 60 to 70 feet in height, and from 6 to 9 feet in girt; leaves abruptly pinnated; leaflets 5 to 8 pairs, nearly opposite, quite entire, obliquely ovate; flowers large, greenish-white, in terminal panicles from April to May; seeds numerous, expanding downwards into a wing, and imbricated in a double series across the cells. The wood is generally brought to Madras in planks from 8 to 10 feet in length, 20 to 30 inches in breadth, and from 3 to 6 inches thick; in appearance, it is very like the wood of *Cedrela-toona*, also possessing in some degree the same agreeable odour, but it is superior to it in strength and toughness, and possessing a greater density; the color in general is of a rich light reddish-brown, sometimes beautifully veined, grains coarse and glossy, and the wood is very liable to warp when exposed. A cubic foot of unseasoned wood weighs from 50 to 54 lbs. *Uses.*—The wood is extensively used by cabinet-makers.

and curled, not easily worked, when well polished has a flossy appearance; in some logs the wood has a tendency to split in concentric layers. A cubic foot of unseasoned wood weighs from 70 to 75 lbs. *Uses.*—The wood is used in ornamental decoration; also for naves of wheels, oil presses, cogwheels and posts for houses.

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48	Citrus aurantium. Citrus nobilis ...	Linn. Lour.	Aurantiaceæ.	Orange.......................... *Eng.* Kitchlie............... .... *Tam.* Kitchidie....................... *Tel.* Naringee............. ...... *Hind.* Kumla-neboo...... .... *Beng.*	·784	49	3,481	14,702	717	·0114

48. *Characteristics and uses.*—The tree is cultivated for the sake of its fruit, and is found in almost all the gardens in India; it grows from 20 to 25 feet in height, and from 1 to 1½ feet in girt, armed with axillary spines; leaves oval, elongated, acute, with winged petioles; flowers large, white and fragrant; fruit spheroidal, terminated by a knob at the top, of an orange yellow color when ripe. The wood is hard, the grain close and even, of a yellow color, liable to crack when exposed; it works tolerably easy, and yields a smooth surface. A cubic foot of unseasoned wood weighs from 65 to 70 lbs. *Uses.*—The wood is used for articles of turnery and wood-engraving.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
49	Cocus nucifera....	Linn.	Palmaceæ.	Cocoanut-palm................	*Eng.*	1·120	70	3,605	9,150	608	·0110
	Cocus nucifera....	Gærtn.		Taynga........................	*Tam.*						
				Tenga...........................	*Mal.*						
				Tenkaia........................	*Tel.*						
				Naril...	*Hind.*						
				Narikel..........................	*Beng.*						

49. *Characteristics and uses.*—This is one of the most useful trees in India, growing abundantly in the southern parts of the Continent, chiefly on the western side, and the adjacent islands: it grows to a greater perfection according to its proximity to the sea, attaining an altitude from 40 to 50 feet, and from 2 to 3 feet in mean girt. The wood is not so strong as that of the Palmyrah, but is closer grained and of a dark red color, checkered with light brown spots; when planed it gives a smooth surface and stands a good polish. My experimental pieces were not of the best description, they were cut from a tree that grew in Madras; it was upwards of 50 years' old, and the pieces had slight symptoms of decay in them, which accounts for the low numbers indicating the strength. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—This is a more useful tree than the Palmyrah, every part of it is used for some purpose, but it is chiefly valued for the nut. The wood is used on the Western Coast and Ceylon for house-rafters, furniture and fancy articles.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
50	Conocarpus acuminata......... Andersonia acuminata.......... Andersonia lanceolata.......... Anogeissus acuminatus.	Rox. Rox. Rottl. Wall.	Combretaceæ.	Pashee.............................. *Tel.* Paunchee........................... do. Numma.................. ..... *Tam.* Yooung.............................*Burm.*	·944	59	4,352	20,623	880	·0092

50. *Characteristics and uses.*—The late Conductor Bowman brought some specimens of this wood from the Burman jungles, and stated that the tree grows to a very large size, and we find in Dr. Brandis' List of woods of British Burmah "the trunk of the tree is 80 feet up to the first branch, and girting 12 feet at 6 feet from the ground;" it is also found in all the jungles of Central and Southern India, chiefly in the Northern Circars, where it also grows to a large size; leaves without glands, nearly opposite, oval, or oblong, lanceolate, entire acute, when young pubescent, adult ones glabrous; peduncle simple, with one head of small pale greenish flowers. The wood is hard, fibrous and durable; the grain glossy, pretty close, and straight, of a reddish brown color, and sometimes marked with streakes of a darker hue; it neither warps nor cracks, it is hard to work upon, and gives a smooth surface. The sap wood is white; it is also hard and strong, but not durable when exposed. A cubic foot of unseasoned wood weighs from 72 to 75 lbs. *Uses.*—The heart and sap wood for their strength is used by the natives both in India and Burmah for house-building, and in the construction of carts.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity..	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E=\frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P=\frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S=\frac{40 b d^3 \delta}{L^3 p}$
51	Conocarpus latifolia .... Andersonia altissima.............. Anogeissus latifolius............	Rox. Rox. Wall.	Combretaceæ.	Vellay naga................ *Eng.* Vellay naga............... *Tam.* Vuckahlee.................. do. Seri-maun..................... *Tel.* Baib-ya...................... *Burm.*	1·100	65	5,033	21,155	1,220	·0079

51. *Characteristics and uses.*—This tree yields superior wood for sustaining cross-strain and direct cohesive strength, it abounds in the Annamallay forests, also in other parts of India and Burmah; it grows to the same size as Conocarpus acuminatus; leaves alternate, entire, elliptical; flowers small greenish pale, in January. The wood is heavy, tough, durable and fibrous, close and even-grained, of a dark brown color, interspersed with darker colored veins. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—The wood is esteemed by the natives as a superior wood for ship and house-building; it is also used in the construction of carts and furniture; and it has been recommended to be used in the Gun Carriage Manufactory as a substitute for Trincomallee. The sap wood is also strong, hard and close-grained, but not durable; used in the construction of country carts and native houses.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
52	Cynometra ramiflora. Cynometra ramiflora. Cynometra canliflora.	Linn. Lam. Wall.	Leguminosæ.	Ooroopoo Irrapoo Iripa Halmendora	*Eng.* *Tam.* *Mal.* *Cyng.*	·896	56	4,092	19,036	826	·0097

52. *Characteristics and uses.*—The tree abounds in the Malabar forests, growing from 60 to 70 feet in height, and from 5 to 6 feet in girt; leaves composed of two to six opposite leaflets; flowers white, springs from the branches among the leaves. A few planks of this wood, about 18 to 25 feet in length, 21 inches in breadth, and 8 inches thick, were received from the Western Coast for experiment. The wood possess great strength and stiffness, it is close-grained, hard and durable, of a light brown color, but cracks and splits when exposed. A cubic foot of unseasoned wood weighs from 65 to 68 lbs. *Uses.*—The wood is used in house-building and in the construction of carts: chips of this wood infused in water gives a dark purple dye.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
53	Dalbergia frondosa. Dalbergia arborea	Rox. Heyn.	Leguminosæ.	Moulmein Lance-wood...... *Eng.* Moukshow.................... *Burm.* Yerra-patserroo............... *Tel.*	·992	62	4,283	24,589	1,003	·0093

53. *Characteristics and uses.*—A log of this wood was received from the Western Coast, and the late Conductor Bowman also brought some specimens from the Burman forests, the tree is said to be abundant in the Tenasserim Provinces; it is also found in the jungles of Central and Southern India. It grows from 50 to 60 feet in height; the girt, seldom exceeds 5 feet, the bark is very smooth and slippery; leaves pinnate, leaflets about five pairs, alternate, cuneate, oval emarginate, when very young silky; flowers small bluish white, from May to June; legumes lanceolate one to four seeded. The wood is much superior to Saul or Teak in transverse and direct cohesive power, it is hard and durable; the grains close, even and straight, of a reddish brown, or claret color, and stands a good polish; even the sap wood, which is of a light grey color, is hard and close-grained, and not much inferior to the heart wood in strength. A cubic foot of unseasoned wood weighs from 73 to 78 lbs. *Uses.*—Mr. Mason says "the Karens make bows of this wood;" from its strength and texture I think it will be a valuable wood to the Engineer and Cabinet-maker.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
54. [illegible]	[illegible]	Leguminosæ	Black-wood... Eng. [illegible] [illegible]... Mal. Shwet-sal... Beng. Yendike... Burm.	[illegible]	[illegible]

54. *Characteristics and uses.*—This is one of the most valuable timber trees in Southern India, the wood is known by the name of Rose or Black-wood. It grows to an immense size in the Annamallay forest, from 40 to 50 feet in height, and from 7 to 10 feet in girt, it is also found in the other parts of India and Burmah; leaves pinnate; leaflets alternate, orbicular, emarginate; flowers small white, in May and June; legumes, oblong, lanceolate. The wood is close-grained, strong, flexible, fibrous, and durable, of a deep purple color, sometimes mottled with greenish black veins, fading to dark brown or black, admits of a high polish; when sawn, emits an agreeable odour. A cubic foot of unseasoned wood weighs from 58 to 62 lbs. *Uses.*—The wood is held in great repute by Cabinet-makers; of late the Madras Government turned their attention to it for the construction of Gun Carriages, for which purpose it has long been used at Bombay.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$.	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
55	Dalbergia paniculata..............	Rox.	Leguminosæ.	Piangany...................... *Eng.* Piangany...................... *Mal.* Putchalay...................... *Tam.* Soy-yew...................... *Burm.*	·768	48	4,026	15,555	872	·0099

55. *Characteristics and uses.*—This tree attains to a tolerable large size, and abounds in the Travancore forests of Malabar; it is also found in the Deccan and Burman forests; flowers small bluish white, in May and June. The wood is strong, hard, close-grained and tough, of a dirty white color. A cubic foot of unseasoned wood weighs from 57 to 60 lbs. *Uses.*—The timber not being much used, its merits are as yet little known.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L^3 p}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
56	Dalbergia sissoo.	Rox.	Leguminosæ.	Sissoo.......................... *Eng.* Seessoo.......................... *Hind.* Seessoo.......................... *Beng.* Sissu.......................... *Tel.*	·800	50	4,022	21,257	870	·0099

56. *Characteristics and uses.*—The wood of this tree, with that of Dalbergia latifolia, is sold in the market under the name of Rose-wood, and from the near resemblance it cannot be distinguished. The tree grows from 40 to 50 feet in height, and from 4 to 6 feet in girt; leaves pinnate; leaflets alternate, orbicular, or obcordate, with a short sudden accumination; flowers small, yellowish white, in May and June; legumes lanceolate. The wood is close-grained, hard and flexible, of a dark purple color fading to brown. A cubic foot of unseasoned wood weighs from 60 to 65 lbs. *Uses.*—The wood is extensively used in the Bengal Provinces for furniture, and in the construction of Ordnance Carriages, and other works.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
57	Dillenia pentagyna..............	Rox.	Dilleniaceæ.	Toothed Dilennia............	*Eng.*	1·120	70	3,650	17,053	907	·0108
				Pinnay.........................	*Tam.*						
	Colbertia Coromandeliana......	D.C.		Gode-parre....................	*Cyng.*						
				Chinna-kalinga...............	*Tel.*						
	Wormia Coromandeliana......	Spr.		Kanagalu.......................	*Can.*						
				Bjooben.......................	*Burm.*						
				Yeen-ga.......................	do.						

57. *Characteristics and uses.*—The tree is common in the jungles of Central and Southern India, and of Burmah; timbers from 18 to 20 feet in length, and from 4 to 5 feet in girt, are procurable; leaves are broadly lanceolate and sharply-toothed; flowers gold-colored, fragrant, in March and April. The wood is close-grained, strong, tough, fibrous and durable, even underground, of a reddish brown color, and a pretty wavy surface on one side; not easily worked, and subject to warp and crack. A cubic foot of unseasoned wood weighs from 85 to 90 lbs. *Uses.*—The wood is used in house and ship-building; and it is well adapted for cabinet-making purposes.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
58	Dillenia speciosa. Dillenia Indica...	Thumb Linn...	Dilleniaceæ.	Tha-byew........................ *Eng.* Tha-byew........................ *Burm.* Uva.............................. *Tam.* Pedakalinga...................... *Tel.* Syalita.......................... *Maly.* Chalita.......................... *Beng.*	·720	45	3,355	12,691	721	·0119

58. *Characteristics and uses.*—The tree is found in India and Burmah, growing from 40 to 50 feet in height and from 6 to 8 feet in girt; leaves oblong serrated; flowers white, large, fragrant, in June and July; leaflets of the calyx agreeably acid; fruit large and edible. The wood is strong, light, and tough, not easily worked, of a light brown color, and durable in water; it possesses the same characteristics as the *Dillenia pentagyna.* A cubic foot of unseasoned wood weighs from 55 to 60 lbs. *Uses.*—The wood is used in house-building, and it is an excellent wood for gun stocks; the leaves are used by the natives for polishing ivory and horn.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
59	Dillenia scabrella.	Rox.	Dilleniaceæ.	Kyet Zembuin............... *Burm.* Kaloonoot.......................... *Tal.* Koung.................................. *Kar.* Kulgul................................. *Can.* Kurmul................................ *Mah.*	·704	44	3,158	15,070	638	·0129

59. *Characteristics and uses.*—Specimens of this wood were sent by Captain Benson from the Tenasserim Provinces, where, he says, the trees are plentiful, growing from 6 to 8 feet in girt, and recommends the wood for house and ship-building; the wood is not so strong nor dense as the *Dilennia pentagyna*; and in comparing the sap and heart of the latter with the specimens sent from Burmah, I suspect they are only the sap, and not the heart wood. The tree is also found in the forests of Southern India. A cubic foot of unseasoned wood weighs from 55 to 60 lbs. *Uses.*—The natives on the Western Coast use it in the construction of boats.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
60	Diospyros cordifolia............	Rox.	Ebenaceæ.	Ebony........................ Vuckana..................... Kak woolimera............... Bungab......................	*Eng.* *Tam.* *Tel.* *Beng.*	1·120	70	4,448	14,702	1,017	·0089

60. *Characteristics and uses.*—The tree is common in the jungles of Southern India, chiefly in that of Coimbatore: it grows from 20 to 30 feet in height, and from 3 to 5 feet in girt, with the trunk and branches armed; leaves entire, alternate, cordate at the base; linear oblong; flowers greenish-white. The wood is strong, hard, close and even grained, of a dark-brown color, some parts beautifully marked with light or reddish brown streaks. A cubic foot of unseasoned wood weighs from 85 to 90 lbs. *Uses.*—The wood is used for furniture and ornamental works.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 b}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 b}{L^3 p}$
61	Diospyros hirsuta.	...	Ebenaceæ.	Calamander................... *Eng.* Calie Medireye............... *Cyng.* Coramundalum............... *Tam.*	·960	60	4,296	19,830	751	·0093

61. *Characteristics and uses.*—This is one of our most valuable woods; it is said to be the produce of Ceylon, and the jungles on the Coromandel Coast; the wood is sold in the market in logs from 10 to 12 feet in length, and from 3 to 4 feet in girt; it is very hard and of a close and even grain, beautifully marked alternately, with irregular black and brownish colored veins, sometimes mottled; it works smoothly, and stands a very high polish. The wood of *Diospyros Montana* of the Northern Circars, differs from the above in being striped alternately black and white, the latter wood is superior in hardness and appearance. A cubic foot of unseasoned wood weighs from 70 to 75 lbs. *Uses.*—The wood is used by Cabinet-makers for carving, inlaying and other ornamental works.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
60	Diospyros cordifolia..............	Rox.	Ebenaceæ.	Ebony........................ *Eng.* Vuckana..................... *Tam.* Kak woolimera............... *Tel.* Bungab....................... *Beng.*	1·120	70	4,448	14,702	1,017	·0089

60. *Characteristics and uses.*—The tree is common in the jungles of Southern India, chiefly in that of Coimbatore: it grows from 20 to 30 feet in height, and from 3 to 5 feet in girt, with the trunk and branches armed; leaves entire, alternate, cordate at the base; linear oblong; flowers greenish-white. The wood is strong, hard, close and even grained, of a dark-brown color, some parts beautifully marked with light or reddish brown streaks. A cubic foot of unseasoned wood weighs from 85 to 90 lbs. *Uses.*—The wood is used for furniture and ornamental works.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
61	Diospyros hirsuta.	...	Ebenaceæ.	Calamander.................... *Eng.* Calie Medireye............... *Cyng.* Coramundalum............... *Tam.*	·960	60	4,296	19,830	751	·0093

61. *Characteristics and uses.*—This is one of our most valuable woods; it is said to be the produce of Ceylon, and the jungles on the Coromandel Coast; the wood is sold in the market in logs from 10 to 12 feet in length, and from 3 to 4 feet in girt; it is very hard and of a close and even grain, beautifully marked alternately, with irregular black and brownish colored veins, sometimes mottled; it works smoothly, and stands a very high polish. The wood of *Diospyros Montana* of the Northern Circars, differs from the above in being striped alternately black and white, the latter wood is superior in hardness and appearance. A cubic foot of unseasoned wood weighs from 70 to 75 lbs. *Uses.*—The wood is used by Cabinet-makers for carving, inlaying and other ornamental works.

62	Diospyros melan[illegible]	[illegible]	Eben[illegible]	[illegible] Tindoo........................ *Hind.* Kiew kendon................ *Beng.*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

62. *Characteristics and uses.*—The tree grows to a large size; logs from 8 to 10 feet in length, and from 3 to 4 feet in girt of heart wood have been received into the Gun Carriage Manufactory; leaves nearly opposite, oblong, lanceolate, acute at the base, coriaceous, entire obtuse; flowers white, in April and May. The wood is heavy, close, and even-grained, of a dark or black color, stands a high polish. The sapwood is white, hard, close-grained, and strong, but not durable. A cubic foot of unseasoned wood weighs from 90 to 100 lbs. *Uses.*—The wood is used by Cabinet-makers for inlaying and ornamental turnery; the sapwood is used by the natives for carts and house-building.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
63	Dipterocarpus alatus............	Rox.	Dipterocarpaceæ.	Wood-oil tree.................. *Eng.* Aing............................ *Burm.* Sooahan....................... *Talien.*	·720	45	3,247	18,781	750	·0123

63. *Characteristics and uses.*—This is one of the Wood-oil trees; specimens of this wood were sent by Captain Benson from the Tenasserim Provinces, who recommended it for house-building, at the same time stating that it is not durable when exposed to wet; it is nearly equal to Teak in transverse strength, but superior in direct cohesive power and of the same specific gravity. The wood is coarse-grained and hard; when first cut it has a strong terebenthine smell and of a reddish color, which turns to light-brown after exposure. A few logs of this wood from 18 to 20 feet in length and 5 feet mean girt were received from Burmah. A cubic foot of unseasoned wood weighs from 52 to 56 lbs. *Uses.*—Dr. McClelland states that the wood is used by the Burmese for every purpose of house-building.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
64	Dipterocarpus turbinatus......	Gœrtn.	Dipterocarpaceæ.	Wood-oil tree.................. *Eng.* Kanyeen...................... *Burm.* Tilea gurjun.................. *Beng.* Hore.......................... *Cyng.*	·720	45	3,355	15,070	762	·0119

64. *Characteristics and uses.*—This is another of the Wood-oil trees growing to a lofty height in the jungles; logs from 20 to 30 feet in length, and from 4 to 5 feet in girt were sent from Burmah for experiment; leaves ovate, or oblong ovate; flowers large, white tinged with red in March; the tree is said to be abundant in the forests of Northern India and Burmah. The timber is strong, but not very durable, rather coarse-grained of a light brown color; not easily worked, possessing a strong, but not an unpleasant smell. A cubic foot of unseasoned wood weighs from 52 to 56 lbs. *Uses.*—The wood is used for house and boat-building.

[illegible] —The tree is also called [illegible] in Tamil [illegible] the wood being used in the manufacture of native combs; it grows from 20 to 30 feet in height, and from 2 [illegible] it as a tree that is "more remarkable for its fine form than the length and thickness of the bole;" the leaves are opposite, elliptical, or ovate crenate, serrated; flowers small, yellow. The wood is not very strong nor stiff, but it is tough, close and even-grained, and the surface beautifully curled and flowered, of a reddish-brown color. A cubic foot of unseasoned wood weighs from 60 to 65 lbs. *Uses.*—Used by the natives in the manufacture of combs, and other economical works; it is well suited for picture frames and other ornamental articles; from its handsome appearance it merits the attention of the cabinet-maker.

[illegible] aspera	[illegible]	Mor[illegible]	Cheora……… Beng. Seeura……… ……… Hin. Nuckchilnie……… ……… Duk.	[illegible]

66. *Characteristics and uses.*—The tree is common all over India, growing from 20 to 25 feet in height, and from 3 to 4 feet in girt; but it is said to grow more stunted towards the south; leaves are alternate, obovate, with the upper surface rough, and serrated at the apex; flowers small, greenish-yellow; fruit drupaceous, of a deep yellow color. The wood is light, tough and coarse-grained, of a brown color, easily worked, and is liable to warp when exposed. A cubic foot of unseasoned wood weighs from 52 to 55 lbs. *Uses.*—The wood is used by the natives for boards, boxes, felloes of country cart wheels, and thumballams or wooden trays.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
67	Eriodendron anfractuosum ... Gossampinus rhumphii ... Bombax pentandrum ... Ceiba pentandra.	D. C. Schott. Linn. Gœrtn.	Bombaceæ.	White-cotton...... .... *Eng.* Elavum........................ *Tam.* Poor........................... *Tel.* Pania.............. .... *Mal.* Huttian........... .... *Hin.* Shwet-shimool... .... *Beng.*	·480	30	2,043	9,518	400	·0195

67. *Characteristics and uses.*—The tree is common in gardens about Madras, it can be distinguished even at a distance from other trees by its peculiar growth, having horizontal branches, two or three springing from a point on the stem ; it grows from 40 to 50 feet in height, and from 5 to 6 in girt : sometimes it girts 8 feet in old trees ; leaflets entire, lanceolate ; flowers white, in February and March ; capsules spindle-shaped from 5 to 6 inches in length, containing white silky-cotton. The wood is light, soft and coarse-grained, of a brown color, easily worked, possessing little strength. A cubic foot of unseasoned wood weighs from 38 to 40 lbs. *Uses,*—The wood is used in the manufacture of mootchie boxes and coffins ; the cotton is used for stuffing beds.

68. *Characteristics and uses.*—This, as the name implies, is not an Indian tree; a log about 15 feet in length and 5 feet in mean girt was sent to the Gun Carriage Manufactory from Australia for experiment. The wood is of a grey color, hard, close and even-grained, heavy and durable, and not liable to crack; it is a little stiffer and superior to Teak in strength, but not easily worked. A cubic foot of unseasoned wood weighs from 80 to 85 lbs. *Uses.*—The wood has not been used as yet for any Ordnance purpose; but from its close hard grain, I should think it well suited for articles of turnery, cog-wheels, wedges, and trenails.

[illegible]

[illegible] is a common hedge-plant; it grows from [illegible] and tough, easily worked and gives a very smooth surface; if it is not properly seasoned, it is liable to warp and crack. A cubic foot of unseasoned wood weighs from 45 to 50 lbs. *Uses.*—The wood is used by Cabinet-makers for veneering and toys; the charcoal from this wood is considered the best for manufacturing gunpowder. During the hot season when water is low in the tanks, to catch the fishes in them, the villagers throw in bundles of green twigs, which intoxicates and kills the fishes.

70. Ficus Indica	Roxb.	[illegible]	[illegible]	Tam.
Ficus Bengalensis	Linn.		[illegible]	[illegible]
Urostigma Bengalense......	...Rheede	Mor	Marri..........................	Tel.
			Peralu..............................	Mal.

70. *Characteristics and uses.*—This tree is one of the commonest in India growing to a large size, from 4 to 6 feet in girt, and from 12 to 15 feet up to the branches; leaves entire, alternate, ovate, bluntly accuminated with parallel nerves, paler underneath, downy when young, afterwards smooth; fruit as large as a middle-sized cherry, eaten by birds and squirrels; propagated either by seeds or cuttings. The adventitious roots which are dropped from the large branches is, as it is well known, a striking peculiarity in this, and many other trees of the same species; these roots in course of time reach the ground, and give additional support to the tree. The wood is light, coarse-grained and brittle, of a light-brown color, neither strong nor durable, but possessing the valuable quality of being durable in water. A cubic foot of unseasoned wood weighs from 43 to 45 lbs. *Uses.*—On account of the wood possessing the quality of being durable under water, it is used for making well-rings, or curbs to support the masonry cylinder of wells, during the process of sinking; it is also used in the villages, when better woods are scarce, for boxes and paneling of doors; the wood of the drops is stronger and tougher, and is used for yokes of bullock carts.

color; it is not durable as an house-building material, but very durable in water. A cubic foot of unseasoned wood weighs from 50 to 54 lbs. *Uses.*—The wood is used by the natives for well-rings, axle-bed of carts, and panelling of doors; the fruit, when green, is pickled by the natives, and also used in their curries.

	Urostigma religiosum	... Rheede	Morac	Pippul........................ *Hind.* Arealu.............. .... *Mal.* Ashwuth.................... *Beng.*	·544	34	2,454	7,535	584	·0162

72. *Characterstics and uses.*—The tree attains to the same size as the *Ficus Indica*, and it is venerated by the Hindoos, they have it in their sacred groves, and near their temples or pagodas; the Brahmins think it a sacrilege to cut the tree or even to burn the dry twigs for fuel; there are two species of this tree, one having cordate leaves, the other cordate with a long narrow accuminate. The wood is light, rather coarse-grained and brittle, neither strong nor durable, of a light brown color. A cubic foot of unseasoned wood weighs from 40 to 42 lbs. *Uses.*—It is used for the same purposes as the fig wood; it is also an excellent wood for packing cases.

[illegible]

78. [illegible] The [illegible] grained, of a brown color, possessing little strength, and not very durable. [illegible] found of it. A cubic foot of unseasoned wood weighs from 40 to 43 lbs.

	tum......... ...	Cor.	Aurantia	Velaga.........	*Tel.*	·800	50	3,248	13,909	645	·0127
	Cratæva vallanga.	Koen.		Khoet..............	*Hind.*						
				Bilvurthitha.................	*Can.*						
				Kuthbel...........	*Beng.*						
				H-man.......................	*Burm.*						

74. *Characteristics and uses.*—The tree is common about the gardens and topes of India and Burmah, growing from 50 to 60 feet in height, and the trunk from 10 to 15 feet up to the branches, with a girt from 4 to 5 feet; it is also found wild in the jungles, where it grows to a greater size, especially in the alpine districts; it is said, the parts about Vellore were once a jungle of these trees; leaves pinnate, when bruised have a pleasant smell; with small pinkish colored flowers; it bears a fruit about the size of a large orange, with a hard shell, containing soft pulp of an astringent nature. The wood is hard and compact, but not very durable, the grain tolerably close and even, of a yellow color. A cubic foot of unseasoned wood weighs from 62 to 65 lbs. *Uses.*—The wood is used by the natives in house-building and in the construction of carts; of late it has been used for Railway sleepers; the pulp of the fruit is eaten mixed with sugar, and also made into jelly and chatney; the cortex of the fruit is made into tops by school boys.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$.
75	Grewia tilliæfolia.	Vahl.	Tilliaceæ.	Sedachoo……… ………… *Eng.* Thudda…………………… *Tam.* Tharra………… ………… *Tel.* Sadachoo……… ………… *Mal.*	·544	34	2,876	17,450	565	·0140

75. *Characteristics and uses.*—Although the tree is said to grow to a large size, and to be abundant in the jungles, yet the timber procurable in the Madras market is of small dimensions; the wood, I believe, of the large branches and not of the trunk; the usual size of scantlings is from 12 to 15 feet in length and 6 × 3 inches. The wood is light and soft, flexible and fibrous, coarse-grained and durable, of a light pinkish color, turning to light-brown, easily worked; its direct cohesive strength is far superior to its transverse strength. A cubic foot of unseasoned wood weighs from 45 to 50 lbs. *Uses.*—The wood is used by the natives for masts of Dhoneys, handles of oars, and for other purposes, where elasticity is required; it is also used for Railway sleepers.

[illegible]	Uvaria longifolia. Unona longifolia.	Lam. Dun.	Anona	Assothee..........................	Tam.	592	[illegible]	2,860	14,720	54	[illegible]

76. *Characteristics and uses.*—The tree for its erect growth and dark shade is planted in avenues in Southern India; it attains a height from 40 to 50 feet, and from 4 to 5 feet in girt; the leaves are alternate, entire, oblong, lanceolate, with a waved margin; flowers greenish-yellow; fruit oblong, dark purple when ripe, and eaten by birds. The wood is light and very flexible, tolerably close and even-grained, of a whitish-yellow color. A cubic foot of unseasoned wood weighs from 44 to 48 lbs. *Uses.*—The wood is used for making drum cylinders.

[illegible]

77. *Characteristics and uses.*—[illegible]
30 to 40 feet, and from 2½ to 3 feet in girt; it hardly grows straight for more than 7 to 9 feet, above which it spreads its branches. After a certain age the wood decays, and the trunk grows hollow; the leaves are alternate, ovate, or oblong, toothed, accuminate at the apex, pubulous at the upper surface, tomentose beneath, with small yellow axillary, and terminal flowers, in August and September; capsules tuberculed, containing sweet mucilage, ripening in March and April; the bark yields strong fibre. The wood is light, soft, and rather coarse-grained, of a light-brown color, not very strong nor durable. A cubic foot of unseasoned wood weighs from 40 to 45 lbs. *Uses.*—The wood will answer for packing cases and panelling when great lightness is required, and the mucilage in the bark is used in clarifying sugar.

nata…… ……Rox.	Legum[illegible]	Autcha…………………… *Tam.*	1·360	85	4,579	12,016	·942	·0087	
		Nar-yeppa………………… *Tel.*							

78. *Characteristics and uses.*—The tree yields a strong and extremely hard, close-grained and durable wood, of a very dark reddish-brown color, susceptible of a fine polish: the tree grows to a pretty good size; some of this wood purchased in the market were from 4 to 5 feet in girt, but generally the girt is from 3 to 4 feet. From its extreme hardness it is a good wood for sustaining vertical pressure, it is subject to split but not warp. The trees are tolerably common in the forests of Southern India, Ceylon and Burmah. A cubic foot of unseasoned wood weighs from 100 to 120 lbs. *Uses.*—The wood is used by the natives for posts of houses, and uprights for picottahs; it also makes strong and durable piles and pillars; and it is an excellent wood for ornamental turnery.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
79	Heritiera minor... Balanopteris minor..............	Lam. Gœrtn.	Sterculiaceæ.	Soondree.......................... *Eng.* Sundri.......................... *Beng.* Sundri..........................*Hind.* Kanazoe..................... *Burm.*	1·024	64	3,775	29,112	816	·0105

79. *Characteristics and uses.*—The tree is said to grow in the Delta of the Ganges, and in some parts of the Tenasserim Provinces; logs from 20 to 30 feet in length, and from 3 to 4 feet are procurable. Specimens of this wood were brought from the Burman forests by the late Conductor Bowman. The wood is strong, fibrous and flexible, tolerably close and straight grained, not very durable, of a light-red color, turning to a reddish-brown, and not easily worked. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—The wood is used in Bengal for poles and shafts of carriages, and spokes of wheels.

80	Hopea odarata....	Rox.	Dipterocar[illegible]	[illegible] Tengaun.................... Burm.	·720	45	3,660	22,209	706	·0109

80. *Characteristics and uses.*—The tree is said to be plentiful in the Tenasserim Provinces, growing to an immense size, logs from 25 to 30 feet in length, and from 3 to 4 feet in girt are procurable. The wood is inferior to Teak in comparative strength, tolerably close and even-grained, of a light-brown color, subject to the attack of worms. A cubic foot of unseasoned wood weighs from 55 to 60 lbs. *Uses.*—The wood is used by the Burmese for house-building, and in the construction of canoes.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
81	Inga species......		Leguminosæ.	Neichittie........................*Tam.*	·944	59	4,577	13,116	782	·0086

81. *Characteristics and uses.*—I believe this is the Inga umbellata; the tree is common in the jungles of Southern India, growing to a moderate size from 20 to 25 feet in height and from 3 to 4 feet in girt. The wood is close, even-grained and durable, of a dark reddish-brown color, with a peculiar scent, it is easily worked and gives a smooth even surface, and does not warp nor split. *Uses.*—The wood is used by the natives for house-building and cart framing; and the leaves are used in medicine by the native doctors.

82	Inga dulcis......... Mimosa dulcis.....	Willd. Rox.	Leguminosæ.	Manilla tamarind...... ... ... *Eng.* Coorokoopully.................. *Tam.*	·640	40	2,516	9,518	517	·0158

82. *Characteristics and uses.*—The tree is said to be introduced from America—it is now quite common—when young they form good hedge plants for gardens and plantations; it grows from 30 to 40 feet in height, and from 3 to 5 feet in girt; leaves bigeminate; leaflets oblong, very unequal sided; flowers small, yellowish-green, in January and February; legumes turgid, and much twisted, in April; the sweet pulp in the legumes is eaten. The wood is hard, coarse-grained and brittle, of a reddish-brown color, when sawn emits a heavy unpleasant smell. A cubic foot of unseasoned wood weighs from 50 to 53 lbs. *Uses.*—The wood is used for country carts, packing boxes, and the panelling of doors for native houses.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
83	Inga Xylocarpa... Mimosa Xylocarpa............... Acacia Xylocarpa	D. C. Rox. Willd.	Leguminosæ.	Peengaudoo................ Eroovaloo.................. Conda-tangheroo........... Jamboo...................... Peengadoe....................	*Eng.* *Tam.* *Tel.* *Hind.* *Burm.*	·928	58	4,283	16,657	836	·0093

83. *Characteristics and uses.*—The tree grows from 50 to 60 feet in height, and from 5 to 9 feet in girt; leaves conjugatedly pinnate; leaflets ovate oblong, acute; flowers small white, in April and May; legumes woody, ovate oblong. The wood is of a very dark red color, fading to dark brown, heavy, hard, close-grained and brittle, not easily worked; when planed up, the surface has an unctuous feel, and not very agreeable smell. A cubic foot of unseasoned wood weighs from 68 to 74 lbs. *Uses.*—It is an excellent wood for posts, Railway sleepers, and in some parts used for house-building.

82	Inga dulcis......... Mimosa dulcis.....	Willd. Rox.	Leguminosæ	Manilla tamarind...... ... ... *Eng.* Coorokoopully.................. *Tam.*	·640	40	2,516	9,518	517	·0158

82. *Characteristics and uses.*—The tree is said to be introduced from America—it is now quite common—when young they form good hedge plants for gardens and plantations; it grows from 30 to 40 feet in height, and from 3 to 5 feet in girt; leaves bigeminate; leaflets oblong, very unequal sided; flowers small, yellowish-green, in January and February; legumes turgid, and much twisted, in April; the sweet pulp in the legumes is eaten. The wood is hard, coarse-grained and brittle, of a reddish-brown color, when sawn emits a heavy unpleasant smell. A cubic foot of unseasoned wood weighs from 50 to 53 lbs. *Uses.*—The wood is used for country carts, packing boxes, and the panelling of doors for native houses.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The modulus of elasticity. E = [illegible]	The value of P or direct cohesion in lbs. per square inch.	Co-efficient for transverse strength. P = [illegible]	Co-efficient for transverse stiffness. S = [illegible]
83	Inga Xylocarpa... Mimosa Xylocarpa............. Acacia Xylocarpa	D. C. Rox. Willd.	Leguminosæ	Poengaudoo.......... ..... *Eng.* Kroovaloo.......... .... *Tam.* Conda-tangheroo...... ... .. *Tel.* Jamboo...... .... *Hind.* Poengadoo.................. *Burm.*	·928	58	4,283	16,657	836	·0093

83. *Characteristics and uses.*—The tree grows from 50 to 60 feet in height, and from 5 to 9 feet in girt; leaves conjugatedly pinnate; leaflets ovate oblong, acute; flowers small white, in April and May; legumes woody, ovate oblong. The wood is of a very dark red color, fading to dark brown, heavy, hard, close-grained and brittle, not easily worked; when planed up, the surface has an unctuous feel, and not very agreeable smell. A cubic foot of unseasoned wood weighs from 68 to 74 lbs. *Uses.*—It is an excellent wood for posts, Railway sleepers, and in some parts used for house-building.

Ixora alba	Rox.										
Ixora decipiens	D. C.	Cinchon[illegible]	Koree Koranhu Korivee pal	Tel.	1·056	66	3,108	14,702	717	·0128	

84. *Characteristics and uses.*—This is called the Indian candle tree, from the green wood being used by the natives for torches when travelling in the dark, it burns with a bright flame, not easily extinguished when once ignited; growing to a moderate size from 15 to 20 feet in height, and from 2 to 3 feet in girt, found in all the jungles of Central and Southern India. The wood is of a reddish-brown color; the grain hard, very close and even, it is easily worked, gives a smooth surface and stands a good polish. A cubic foot of unseasoned wood weighs from 78 to 84 lbs. *Uses.*—The wood is well suited for the lathe.

83. [illegible] the tree grows to a large [illegible]

[illegible] ness. There are two species of the wood, the one light and the other dark reddish brown; the latter is superior wood. It is not so strong and durable as Teak, warps much when exposed. [illegible]
50 to 54 lbs. *Uses.*—The wood is used for furniture and framing for doors and windows when Teak is scarce.

[illegible]	parviflora...... Rox.	Lythra[illegible]	Nundee.......... Mal. Chinangee.......... Tel.	[illegible]

86. *Characteristics and uses.*—The tree is said to be abundant in the Godavery and Canara forests, growing to a very large size; leaves opposite, entire, from oblong oval or obtuse, to ovate and acute: pale beneath; flowers small, white, fragrant, in May and June. This wood possesses almost the same characteristics as Ven Teak and Peemah, only that it is a little inferior in strength, and coarser in grain. A cubic foot of unseasoned wood weighs from 50 to 52 lbs. *Uses.*—This wood is used for the same purposes as the Ven Teak and Peemah.

[illegible]

in May or June; leaves alternate, oblong, glabrous; the tree grows to a moderate size in the plains, where it is valued more for its showy flowers, than for the timber; in jungles, near banks of rivers, it grows to an enormous size, both in India and Burmah. The wood is light and tough, and straight grained, not easily worked; there are two descriptions of this wood, red and white colored, the former is tougher of the two: not being a commercial wood in Madras it is little known to the trade. A cubic foot of unseasoned wood weighs from 50 to 52 lbs. *Uses.*—It is used in the Tenasserim Provinces for house and ship-building, and by the Madras Government for Ordnance purposes, such as cheeks of Gun Carriages, and felloes of wheels, and recommended as a good wood for gun stocks.

88	Laurus species....	...	Lauraceæ	Kye-zai........................ *Eng.* Kye-zai........................ *Burm.*	·960	60	3,598	18,668	810	·0111

88. *Characteristics and uses.*—This is a light yellow colored wood, imported from Burmah, with a tolerable close and even-grain, slightly fragrant, tough and compact; it is equal to Teak in transverse strength, but superior in direct cohesive power. Captain Dance states in his report that the tree is found along the coast from Amherst to Mergui, and along the banks of the Tavoy river; logs 15 feet in length, and 3 feet in girt are procurable, and that the wood is very durable. A cubic foot of unseasoned wood weighs from 78 to 80 lbs. *Uses.*—The wood is used by the Burmese in house-carpentry; in Madras for furniture, and passed off by the natives as Jack-wood.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
89	Maba buxifolia... Ferreola buxifolia.............	Pers. Rox.	Ebenaceæ.	Erumbelie.................... *Eng.* Erumbelie.................... *Tam.* Pishanna.................. ...... *Tel.*	·928	58	3,582	16,290	875	·0111

89. *Characteristics and uses.*—This is one of the trees that produce ebony wood, it grows to a moderate size, from 15 to 20 feet in height, and from 2 to 3 feet in girt; leaves alternate, oval, entire, smooth; flowers monœcious, very small, yellow or white, from January to March; bearing small round berries of an orange-yellow color. The wood is black, close, and even-grained, strong, hard and durable, susceptible of a good polish; my specimens had very little heart-wood in them; the sapwood is also strong and elastic, with a close hard grain of a greyish-white color, not durable nor exempt from worms. A cubic foot of unseasoned wood weighs from 72 to 75 lbs. *Uses.*—The wood is much sought after for helves and tool handles; the berries are eaten by the natives.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
84	Ixora parviflora... Ixora alba...... ... Ixora decipiens....	Vahl. Rox. D. C.	Cinchonaceæ.	Indian candle tree....... .... Shooloondoo................... Koree...... .... Koranhu......... .... Korivee pal...............	*Eng.* *Tam.* *Tel.*	1·056	66	3,108	14,702	717	·0128

84. *Characteristics and uses.*—This is called the Indian candle tree, from the green wood being used by the natives for torches when travelling in the dark, it burns with a bright flame, not easily extinguished when once ignited; growing to a moderate size from 15 to 20 feet in height, and from 2 to 3 feet in girt, found in all the jungles of Central and Southern India. The wood is of a reddish-brown color; the grain hard, very close and even, it is easily worked, gives a smooth surface and stands a good polish. A cubic foot of unseasoned wood weighs from 78 to 84 lbs. *Uses.*—The wood is well suited for the lathe.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
85	Lagerstrœmia microcarpa.........	Wall.	Lythraceæ.	Ven Teak..................... *Eng.* Cutcha cutta.................. *Tam.* Ventakoo......................... *Tel.*	·656	41	3,019	12,691	619	·0148

85. *Characteristics and uses.*—Although the tree grows to a large size in the Annamallay forests and other places, the timber is generally imported in planks from 12 to 15 inches in breadth, and from 2½ to 3 inches in thickness. There are two species of the wood, the one light and the other dark reddish brown; the latter is superior wood. It is not so strong nor durable as Teak, warps much when exposed. A cubic foot of unseasoned wood weighs from 50 to 54 lbs. *Uses.*—The wood is used for furniture and framing for doors and windows when Teak is scarce.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 b}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 b}{L^3 p}$
86	Lagerstrœmia parviflora........	Rox.	Lythraceæ.	Nundy........................ *Eng.* Nundee........................ *Mah.* Chinangee...................... *Tel.*	·640	40	2,013	16,420	467	·0178

86. *Characteristics and uses.*—The tree is said to be abundant in the Godavery and Canara forests, growing to a very large size; leaves opposite, entire, from oblong oval or obtuse, to ovate and acute: pale beneath; flowers small, white, fragrant, in May and June. This wood possesses almost the same characteristics as Ven Teak and Peemah, only that it is a little inferior in strength, and coarser in grain. A cubic foot of unseasoned wood weighs from 50 to 52 lbs. *Uses.*—This wood is used for the same purposes as the Ven Teak and Peemah.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
87	Lagerstrœmia regima......... Adambea glabra.. Flos reginæ........	Rox. Lam. Retz.	Lythraceæ.	Peemah........................ *Eng.* Cadalipua..................... *Tam.* Jarool.......................... *Beng.* Peema-nee.................. *Burm.*	·640	40	3,665	15,388	637	·0109

87. *Characteristics and uses.*—This is a gaudy looking tree when in blossom; flowers either red, or purple, in May or June; leaves alternate, oblong, glabrous; the tree grows to a moderate size in the plains, where it is valued more for its showy flowers, than for the timber; in jungles, near banks of rivers, it grows to an enormous size, both in India and Burmah. The wood is light and tough, and straight grained, not easily worked; there are two descriptions of this wood, red and white colored, the former is tougher of the two: not being a commercial wood in Madras it is little known to the trade. A cubic foot of unseasoned wood weighs from 50 to 52 lbs. *Uses.*—It is used in the Tenasserim Provinces for house and ship-building, and by the Madras Government for Ordnance purposes, such as cheeks of Gun Carriages, and felloes of wheels, and recommended as a good wood for gun stocks.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
88	Laurus species....	...	Lauraceæ.	Kye-zai........................ *Eng.* Kye-zai...................... *Burm.*	·960	60	3,598	18,668	810	·0111

88. *Characteristics and uses.*—This is a light yellow colored wood, imported from Burmah, with a tolerable close and even-grain, slightly fragrant, tough and compact; it is equal to Teak in transverse strength, but superior in direct cohesive power. Captain Dance states in his report that the tree is found along the coast from Amherst to Mergui, and along the banks of the Tavoy river; logs 15 feet in length, and 3 feet in girt are procurable, and that the wood is very durable. A cubic foot of unseasoned wood weighs from 78 to 80 lbs. *Uses.*—The wood is used by the Burmese in house-carpentry; in Madras for furniture, and passed off by the natives as Jack-wood.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
89	Maba buxifolia... Ferreola buxifolia............	Pers. Rox.	Ebenaceæ.	Erumbelie.................. *Eng.* Erumbelie.................. *Tam.* Pishanna................ ...... *Tel.*	·928	58	3,582	16,290	875	·0111

89. *Characteristics and uses.*—This is one of the trees that produce ebony wood, it grows to a moderate size, from 15 to 20 feet in height, and from 2 to 3 feet in girt; leaves alternate, oval, entire, smooth; flowers monœcious, very small, yellow or white, from January to March; bearing small round berries of an orange-yellow color. The wood is black, close, and even-grained, strong, hard and durable, susceptible of a good polish; my specimens had very little heart-wood in them; the sapwood is also strong and elastic, with a close hard grain of a greyish-white color, not durable nor exempt from worms. A cubic foot of unseasoned wood weighs from 72 to 75 lbs. *Uses.*—The wood is much sought after for helves and tool handles; the berries are eaten by the natives.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
90	Mangiferaæ Indica Mangifera montana Mangifera domestica	Linn. Heyne. Gœrtn.	Terebenthaceæ.	Mangoe ... *Eng.* Maah ... *Tam.* Mamadi ... *Tel.* Mava ... *Mal.* Mavena ... *Can.* Am ... *Hind.* Tha-yet ... *Burm.*	·672	42	3,710	9,518	632	·0108

90. *Characteristics and uses.*—The tree is generally diffused, and common to India and Burmah; leaves alternate, lanceolate glabrous; flowers small, greenish yellow, in January and February; fruit drupaceous, in June and July. The wood is coarse and open-grained, of a dull grey color, not durable, gets worm-eaten and greedily devoured by white ants. A cubic foot of unseasoned wood weighs from 52 to 58 lbs. *Uses.*—The wood is used in Madras for packing cases, and lining of furniture, the poorer class of natives use it for door and window frames; the fruit is much esteemed when ripe: when unripe used in preserves and pickles; in some parts of India it is roasted and sherbet made from the juice, and drunk in the hot season; also given in cases of *Coup-de-soleil;* the kernels are given in cases of dysentery; and in times of scarcity it is ground and made into gruel by the poor.

Number.	Genera.	Authority.	Order.	Synonyms.		Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
91	Melanorihea usittata...............	Wall.	Anacardiaceæ.	Varnish tree.................. Ma-yan...................... Theet-see..................... Soothan.............................. Kiahong..............................	*Eng.* *Burm.* *Tal.* *Kar.*	·976	61	3,016	......	514	·0132

91. *Characteristics and uses.*—This is the varnish tree of the Burmese, and according to Dr. Wallich, "it is identical with the majestic khen or varnish tree of Munipoor." Dr. McClelland calls it the "Lignum Vitæ of Pegu," and says, it is plentiful in the Tonghoo and Prome forests; logs from 20 to 30 feet in length, and from 5 to 6 feet in girt, are said to be procurable. The wood is of a dark red color, hard and heavy, close, and even-grained and durable, but brittle, possessing little transverse strength. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—It is used by the Burmese as anchors instead of iron for their boats.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
92	Melia azedarch...	Linn.	Meliaceæ.	Malayvaimboo............... *Eng.* Mullay vaimboo............ *Tam.* Taruka vepa............... *Tel.*	·480	30	2,516	14,277	596	·0159

92. *Characteristics and uses.*—This is the Persian lilac, or bead tree, sometimes called jungle or mountain Margosa; in the plains it grows to a moderate size, scarcely exceeding 20 feet in height, and 2 feet in girt; it grows more lofty and robust in the alpine districts. A few logs that were received from the Annamallay forests, had a mean girt of 8 feet. The leaves are alternate, bipinate, deciduous, falling off in the months of February and March; flowers smallish, externally white, and lilac on the top, fragrant; fruit roundish, and pale-yellow when ripe. The wood resembles the cedar in color, but it is lighter and looser in texture, and slightly bitter, which makes it free from the attacks of insects. A cubic foot of unseasoned wood weighs from 38 to 42 lbs. *Uses.*—The wood is used for light furniture.

[illegible]

[illegible] *Characteristics and uses.*—The tree, according to Dr. Brandis, has a trunk [illegible] to the first branch [illegible]

[illegible] to warp. A cubic foot in its unseasoned state weighs from 62 to 65 lbs. *Uses.*—Dr. Brandis states that the wood is used by the Burmese for "poles of carts, and harrows, yokes, spear-shafts and oars.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
94	Mimusops elengi.	Linn.	Sopotaceæ.	Mimusops.................... *Eng.* Mugadum.................... *Tam.* Elengee....................... *Mal.* Poghada...................... *Tel.* Bholseri...................... *Duk.* Mulsari....................... *Hin.* Bukul.......................... *Beng.*	·976	61	3,653	11,369	632	·0109

94. *Characteristics and uses.*—This is reckoned more an ornamental than a timber tree, generally cultivated in gardens, it grows from 30 to 40 feet in height, the trunk seldom exceeding 10 to 12 feet up to the branches with a girt from 5 to 6 feet ; leaves alternate, oval lanceolate, or oblong, accuminated, glabrous ; flowers white, fragrant, in March and April ; fruit oval, smooth, orange-yellow when ripe, edible. The wood is heavy, close and even-grained, of a pinkish color, turning to reddish-brown, stands a good polish. A cubic foot of unseasoned wood weighs from 76 to 82 lbs. *Uses.*—The wood is used for house-building, and cabinet-making purposes.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
95	Mimusops hexandra............	Rox.	Sopotaceæ.	Pallah........................*Eng.* Palla.................................*Tam.* Palla.................................*Tel.*	1·120	70	3,948	19,036	944	·0101

95. *Characteristics and uses.*—The tree is said to be abundant in the Godavery and Circar forests, growing to a large size; logs from 15 to 20 feet in length, and from 4 to 5 feet in girt were received into the Gun Carriage Manufactory; leaves alternate, cuneiform, or obcordate, deeply emarginate, glabrous and shiny; flowers small, white, in March and April; fruit shape and size of an olive, yellow when ripe, edible. The wood is close and even-grained, hard, compact and durable, of a pinkish color, turning to reddish-brown, susceptible of a very high polish. A cubic foot of unseasoned wood weighs from 84 to 92 lbs. *Uses.*—The wood is used by the natives for oil-presses and posts for houses; it is an excellent wood for rulers, handles of instruments, and other articles of turnery.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
96	Mimusops Indica		Sopotaceæ.	Polava.......................... *Eng.* Palava.......................... *Tam.*	·768	48	4,296	23,824	845	·0093

96. *Characteristics and uses.*—I procured my test pieces of this wood from some of the condemned gun stocks sent from the Arsenal of Fort Saint George. I believe the tree grows in the jungles about Tinnevelly. The wood is rather coarse-grained, but strong, fibrous and durable, works kindly with a smooth surface, of a reddish-brown color; it is nearly as light, but superior to teak in strength. A cubic foot of unseasoned wood weighs from 60 to 64 lbs. *Uses.*—This is one of the woods sanctioned by Government for gun stocks; it is also used in house-building in the parts where it abounds.

[illegible]

[illegible] cut, it is of a bright-yellow color, after exposure it turns to yellowish brown. A cubic foot of unseasoned wood weighs from 35 to 40 lbs. *Uses.*—The wood is used for common purposes, and the natives prefer it for their clogs or wooden slippers; the inner bark and roots are used in dyeing.

[illegible]

Cinch[illegible]

Minn bin.................. ...... *Burm.*
Munjenatie.................... *Mal.*

98. *Characteristics and uses.*—The tree is said to be of fast growth, and is common to Southern India and Burmah, growing from 30 to 40 feet in height; leaves roundish, ovate, accuminate, often slightly cordate at the base, shortly tomentose on both sides; flowers white. A log of this wood, 20 feet in length and 5 feet in girt, was sent from Burmah for experiment: it is strong, hard, close, and a straight-grained wood, not easily worked, does not warp, nor crack, stands a good polish, when fresh from the saw it is of a bright-yellow color, after exposure, turns to yellowish brown, a very good substitute for satin-wood. A cubic foot of unseasoned wood weighs from 65 to 68 lbs. *Uses.*—It is a good wood for posts, handles of instruments, and tools, and will make excellent naves for wheels; chips of this wood and that of morinda citrifolia steeped in water, gives it a purple tinge.

[illegible]

99. *Characterist*[illegible] The tree grows from [illegible] feet in height and 4 to 5 feet in girth; leaves opposite, decussate, cordate; flowers small, yellow, during the rainy season. [illegible] tions of dryness and moisture. A cubic foot of unseasoned wood weighs from 56 to 58 lbs. *Uses.*—This is esteemed as an ornamental wood, and used for cabinet purposes.

[illegible]	[illegible] talis...... ...... Cephalanthus pilulifer.........	Linn. Lam.	Cincho[illegible]	[illegible] Bota-cadmie...... .... *Tel.* Ma-oo.......... .... *Burm.*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

100. *Characteristics and uses.*—The tree is generally found growing in water, on the banks of rivers and tanks, it attains an altitude of between 30 to 40 feet and from 3 to 4 feet in girt; leaves opposite, ovate or oval, bluntish; flowers small, yellow, in April. The wood is light, soft, close and even-grained, of a light brown color, not durable, will rot when exposed to wet. A cubic foot of unseasoned wood weighs from 48 to 52 lbs. *Uses.*—It is used for boarding of floors, panelling of inner doors of houses, palanquins, light trunks, and packing cases.

[illegible]

girt, are procurable in the Burman forests; leaves alternate, about the ends of the branches unequally pinnated; leaflets opposite, almost sessile, oblong-ovate, accuminated, glabrous, entire, paler below; flowers small, greenish yellow, in February. The wood is strong, straight and even-grained, fibrous and elastic, of a reddish color. A cubic foot of unseasoned wood weighs from 66 to 70 lbs. *Uses.*—It is used by the Burmese for house-building, and a variety of other purposes; from the color and evenness of the grain, it is a good wood for cabinet work.

[illegible]

102. *Characteristics and uses.*—This tree, which is said to be introduced from the West Indies, is now quite domesticated in India, and is even found growing wild in waste places, when young it is used as an hedge plant: with its leaves and bark of lively green, and bright yellow flowers, streaked with red, forms an ornamental garden fence; it grows to a moderate size, from 10 to 15 feet in height, and from 1 to 1½ feet in girt. The heart, which is of a small diameter, is of a reddish-brown color, close, straight, and even-grained, easily worked and not liable to warp nor crack. The sap-wood is also close and straight grained, of a yellow white color. A cubic foot of unseasoned wood weighs from 50 to 53 lbs.

[illegible]

entire, oblong leaves; flowers small, greenish white; drupe furnished from six to seven thick coriaceous wings; it is said to be abundant in the Canara, and also in the jungles of Central India and Burmah. The wood is equal to teak in strength, it is harder, and more brittle, not easily worked, the color is red, marked with irregular dark streak, the grains coarse and shining, it merits the attention of the cabinet-maker. A cubic foot of unseasoned wood weighs from 65 to 70 lbs. *Uses.*—Used in house-building and in the construction of carts.

[illegible]	Genera	[illegible]	[illegible]	Synonyms.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
104.	Phœnix sylvestris............... Elate sylvestris...	Rox. Linn.	Palmœ.	Date palm... Eng. Pala-eechum... Tam. Eeta........................ Tel. Khajoor........................ *Beng.* Khajoor........................ *Hind.*	·627	39	3,313	8,356	512	·0120

104. *Characteristics and uses.*—This is said to be the "Date of Arabia," and although it grows and thrives in India, the fruit does not come to that prefection as it does in its native soil: it grows from 30 to 40 feet in height, and from 1 to 1½ foot in girt; fronds from 10 to 15 feet in length, with numerous densely fascicled, ensiform, rigid pinnæ; flowers monœcious in pendulous spikes; fruit oblong, sweet when ripe. Specimens of this wood were kindly sent to me by Mr. W. Dunhill, they were cut from an old tree which grew in his garden at Nungumbakum. The wood is coarse grained, and of a brown color, not very strong nor durable. A cubic foot of unseasoned wood weighs from 50 to 52 lbs. *Uses.*—The wood is esteemed of little value, used only for native huts, and fire-wood for kilns. The tree is valued for the juice it yields, called "date toddy," which is either drunk fresh or boiled down into sugar, or it is used in distilling the country arrack.

A cubic foot of unseasoned wood weighs from 58 to 62 lbs. *Uses.*—The wood is used by the natives for Gun stocks and furniture, and in preference to other woods for well rings, on account of its durability in water; the fruit is pickled or preserved.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
106	Poinciana elata...	Rox.	Leguminosæ.	Vathanarien...... .... *Tam.* Chilikeswarum............ } *Tel.* Sunkeswarum .... } Sunkaser.................. *Hin.*	·720	45	3,165	11,700	516	·0127

106. *Characteristics and uses.*—The tree is common in Southern India, growing from 20 to 30 feet in height, and from 3 to 3½ feet in girt; the Mahomedans have it planted in their cemetries; and I have seen it planted in avenues at Arcot, and its suburbs; it grows either from seed or cuttings; leaves bipinnated; pinnæ from 8 to 10 pairs, with 15 to 20 pairs of oblong linear leaflets; flower large, white, and fragrant, it turns yellow as it fades; legumes flat, and lanceolate. The wood is of a yellow color, tolerably close and even-grained, is easily worked and gives a smooth surface, it warps slightly, but never cracks. A cubic foot in its unseasoned state weighs from 54 to 58 lbs. *Uses.*—I have not known the wood to be used, but it is well suited for cabinet-making purposes; the leaves and bark are used by the native doctors as an aperient.

[illegible]	Pongamia glabra. Vent.	Poongam	Mad.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Galedupa Indica. Lam.	Kurung	Mad.

front of his house, from an idea that its shade and exhalation are unwholesome; it is common to both Peninsulas of India, growing from 30 to 40 feet in height, and from 4 to 5 feet in girt; leaves unequally pinnated; leaflets opposite, ovate, accuminated, glabrous; flowers white, in axillary racemes; legumes oblong, with a short recurved beak. The wood is light, tough and fibrous, coarse and even-grained, of a light yellowish brown color, not easily worked nor gives a smooth surface; it is improved in strength and color by being seasoned in water. A cubic foot in its unseasoned state weighs from 48 to 55 lbs. *Uses.*—The wood is used for a variety of purposes, the solid wheels of the Odder carts are of this wood, and a few of my trial specimens were cut from one of them, and the rest were from a tree that grew in Madras; the legumes are strung round the necks of children that have the hooping cough, and oil is expressed from the seeds, which is used by the natives for lamps.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

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108	Prosopis spicigera Adenanthera aculeta..............	Linn. Rox.	Leguminosæ.	Shumee.............................*Eng.* Shamee.............................*Ben.* Schamee.............................*Tel.* Vunny.............................*Tam.* Perambay.............................*Mal.*	1·152	72	3,481	17,876	981	·0116

108. *Characteristics and uses.*—The tree grows from 25 to 30 feet in height, and from 2 to 3 feet in girt, while it seldom attains this size in the plains of Southern India; it grows larger in the alpine districts, and abounds in all the jungles of India; the tree is armed with scattered prickles; leaves bipinnate, with small yellow flowers; the legumes are cylindrical, filled with mealy pulp, which is eaten by the natives. The wood is of a dark red color, straight and close-grained, hard and durable, superior to Teak in strength. A cubic foot of unseasoned wood weighs from 95 to 100 lbs. *Uses.*—The wood is used in the construction of carts and house-building.

[illegible]

(P. pyriferum), the fruit is esteemed both by Europeans and natives; the tree is extensively cultivated, and thrives without much care, in any soil; it also grows wild in many parts from the seeds being cast by flying foxes and birds; the tree grows to a moderate size, and I have not seen the stem exceed 3 feet in girt; it has entire, oval, or oblong, lanceolate leaves, with white fragrant flowers. The heart wood is grey-colored, hard, tough, very flexible, and light, but not strong: it is very close, and fine-grained, works easily and smoothly. A cubic foot of unseasoned wood weighs from 58 to 60 lbs. *Uses.*—It is an excellent wood for spear handles, and handles for Philosophical instruments; Dr. Hunter uses it for wood engraving, and reckons it as one of the best of Indian woods for that purpose; the fruit is used for the dessert; it is also prepared in tarts and made into jelly.

[illegible]	Genera.	[illegible]	[illegible]	Synonyms.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
110	Pterocarpus [illegible]	[illegible]	Legum[illegible]	[illegible] Hanee........................ *Can.* Beebla........................ *Mah.*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

110. *Characteristics and uses.*—This tree abounds in the forests of Burmah and Andaman islands, growing to such a size as to yield logs from 18 to 20 feet in length, and from 5 to 6 feet in girt; leaves unequally pinnated; leaflets alternate, ovate, lanceolate, glabrous; flower small, yellow, fragrant, in June and July; legumes long-stalked, surrounded by a membranaceous wing. It yields a strong timber of a deep or pale-red color, a good wood for sustaining vertical pressure, in appearance it is somewhat like Mahogany, but heavier and coarser grained; the wood of the root is beautifully variegated and darker in color, the wood when sawn has a strong aromatic smell, when steeped in water it imparts a dark blue tinge. A cubic foot of unseasoned wood weighs from 65 to 70 lbs. *Uses.*—It is used by Government in the construction of Ordnance Carriages, and it is said that it is also introduced in the Royal Arsenal at Woolwich for a similar purpose.

[illegible]

[illegible] *Characteristics and uses.*—The tree attains a considerable size, growing from [illegible] to 80 feet in height, and [illegible]

The wood is strong, and durable, tolerably close-grained and brittle, of a light-brown color, not easily worked, when steeped it gives a blue tinge to water in the same manner as Pterocarpus Dalbergiodies. A cubic foot of unseasoned wood weighs from 65 to 70 lbs. *Uses.*—It is extensively used in the inland countries for house-building and cart-framing.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

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112	Pterocarpus santalinus.........	Linn.	Leguminosæ.	Red sandalwood............ *Eng.* Segapoo shandanum......... *Tam.* Kachandanum........... *Tel.* Ooruttah chundnum....... *Mal.* Rukhto chandun.......... *Hind.* Ruckta chandana......... *Beng.* Lalchundel...... .... *Duk.*	1·120	70	4,582	19,036	975	·0088

112. *Characteristics and uses.*—The timber of this tree is brought from the Nuggery and other jungles of Southern India in billets, and sold in the bazar by weight as a dye wood; it grows to a large size in the jungles, from 50 to 60 feet in height, and from 4 to 5 feet in girt; leaves unequally pinnatad; leaflets roundish retuse; flowers yellow, streaked with red; legumes one seeded slightly membranaceous. The wood is strong, heavy, hard, close, and even-grained, very durable, and stands a good polish: when fresh from the saw it is highly fragrant and of a bright-red color interspersed with black streaks, fading to dark-red. A cubic foot in its unseasoned state weighs from 90 to 95 lbs. *Uses.*—Used for posts of houses, and for its durability, used as clamps in building.

[illegible] Sandal wood [illegible]

112 Santalum album, Linn. [illegible] Mal. [illegible]

[illegible] Chundun [illegible] Hind. [illegible]

[illegible] yellow the heart wood [illegible] found in [illegible]
Madras; but it does not attain that size as it does in the high lands. The largest tree I have seen hardly girted 2 feet; a tree which I got cut in Vepery had 3 inches of heart wood in it, the wood was delightfully fragrant, and the age I was told, was from 15 to 20 years; the leaves are entire, oblong, and smooth; flowers at first light-yellow, as it fades turns dark-purple, bearing small round black berries, eaten by birds and the poorer classes of natives. The wood is imported to Madras from Mysore in junks from 1 to 1½ feet in length, and the greatest diameter I have seen was 8 inches. I believe the trees are cut down before the heart has attained the proper size. A cubic foot of unseasoned wood weighs from 72 to 75 lbs. *Uses.*—The wood is valued much by the natives, who use it as a perfume, and it is sold from 8 to 12 annas a viss in the bazaars; it is also sought after for making jewel and work boxes.

	[illegible]ginatus	Vahl.	Sapind[illegible]	[illegible] *Tam.* Rarak *Mal.* Ritah *Duk.* Buro-reetha *Hin.* Hseik khyae *Burm.*	·928	64	3,905	15,495	682	·0102

114. *Characteristics and uses.*—The tree is common to India and Burmah, growing from 25 to 30 feet in height, and from 3 to 4 feet in girt: with abruptly pinnated leaves; leaflets entire, oblong, retuse, or emarginate; flowers small, white in terminal panicles. The wood is hard, stiff and close-grained, not very durable, cracks if much exposed, does not work easily, of a light yellow color. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—The wood is used by the natives for posts, door framing, and in the construction of carts; the berries are used for washing.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
115	Shorea obtusa.....	Wall.	Dipterocarpaceæ.	Thee-ya........................ *Eng.* Thee-ya........................ *Burm.*	·928	58	3,500	20,254	730	·0111

115. *Characteristics and uses.*—This wood was brought from Burmah by the late Conductor Bowman, who stated that it grows to a very large size, and is plentiful in Sangoay, Oaken and Thyne districts, and that it is used by the Burmese in the construction of carts, oil, and rice-mills. The wood is heavy and compact resembling Saul in the grain, but much closer, and darker-colored. A cubic foot of unseasoned wood weighs from 70 to 76 lbs. *Uses.*—The wood is used by the Burmese in the construction of carts, oil and rice mills.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
116	Spondias mangiferæ…… Spondias amara… Spondias paniculata…… Mangifera pinnata…… Poupartia mangifera……	Pers. Lam, Rox. Kœn. Blume.	Anacardiaceæ.	Hog plum…… *Eng.* Caat maah…… *Tam.* Adevie mamadie…… *Tel.* Caat ambolum…… *Mal.* Junglee am…… *Duk.* Amna…… *Beng.* Chooay…… *Burm.*	·688	43	3,065	8,357	614	·0130

116. *Characteristics and uses.*—The tree is also called Murree Maungah by the natives, and Marian by Europeans; it grows to a large size in the jungles, from 40 to 50 feet in height, and 3 to 5 feet in girt; it is found both in India and the Tenasserim Provinces; leaves alternate, unequally pinnated, with entire ovate or oblong leaflets; flowers small, white; drupe oval, yellow when ripe, and extremely acid. The wood is brownish colored, hard, and coarse grained, not very strong, nor durable. A cubic foot in its unseasoned state weighs from 50 to 54 lbs. *Uses.*—The wood is used for the same purpose as the common Mangoe wood; the fruit when green is either pickled or used by the natives in their curries.

small, greenish white, in March and April; capsules five celled with winged seeds.— [illegible] wood is [illegible] valued for its strength and durability, it is of a bright red color when fresh sawn, turns darker after exposure, the grain is tolerably close, but not even, and does not work smooth. A cubic foot of unseasoned wood weighs from 80 to 85 lbs. *Uses.*— The Hindoos prefer this wood above others for the wood-work of their houses, and it is the best wood for clamps in masonry walls; its durability is such, that when some of the posts of this wood, in the palisades of Fort Saint George, were taken up in 1859, the wood was fresh, and in no way deteriorated; it is not known when the palisades were erected, but supposed to be in the seventeenth century. Another piece was taken out of a wall in the workshop of the manufactory, during the recent alterations, and tested; a piece 3 feet in length 1½ inch square stood 1,232 lbs. before it broke down. The workshop was erected in 1803; it also makes excellent piles, and used for Railway sleepers.

[illegible]

Letkhoke...................... Burm.

118. *Characteristics and uses.*—The tree is common in Southern India, Ceylon and Burmah; in the plains it grows from 40 to 50 feet in height, and from 4 to 5 feet in girt, it attains a larger size in the alpine jungles; and Dr. Brandis states that in Burmah the trunk "is 50 feet up to the first branch, and girting 10 feet at 6 feet from the ground;" leaves compound, peltate; leaflets from 7 to 9, oblong, lanceolate, accuminated; flowers brownish tinged with red at the base, very fetid. The wood is light, tough, and rather open grained, of a yellowish-white color, easily worked and is not subject to split, nor warp. A cubic foot in its unseasoned state weighs from 34 to 38 lbs. *Uses.*—The wood is used for house-building, and in the construction of canoes; it is well suited for light travelling trunks and packing cases; the seeds are roasted and eaten by the natives.

[illegible] *Characteristics and uses.*—The tree grows to a moderate size; the trunk is generally 9 or [illegible] perty. The wood of this is hard, durable, and stiff, of a light-brown color, streaked with white, exempt from the attack of white ants and insects, found in the hilly districts of Southern India. A cubic foot of unseasoned wood weighs from 56 to 70 lbs. *Uses.*—The seed is used by natives for poisoning fish in Tanks, and the wood is used in the construction of carts and house-building; and it is the superstitious belief of natives, that by having a piece of this wood in a house it exempts the inmates from evil.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
120	Syzygium Jambolanum Eugenia Jambolana Syzygium caryophyllifolium	D. C. Lam. D. C.	Myrtaceæ.	Jumlum .... *Eng.* Nawel .... *Tam.* Naredoo .... *Tel.* Jamoon .... *Hind.* Perin-njara .... *Mal.* Kaḷajam .... *Beng.*	·768	48	2,746	8,840	600	·0145

120. *Characteristics and uses.*—The tree is common in Southern India, found in topes and gardens, and in some parts planted in avenues; it grows to a good size, the trunk is from 18 to 20 feet up to the branches, and from 5 to 6 feet in girt; the leaves oval, oblong, more or less accuminated, or obtuse, coriaceous; flowers small white, in March and April; fruit olive shape, of a dark bluish purple color, edible. The wood is tolerably close and even-grained, not very strong, nor durable, of a dirty brown color. A cubic foot of unseasoned wood weighs from 60 to 62 lbs. *Uses.*—Used in the country for door and window frames of native houses and cart framing.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
121	Tamarindus Indica......... Tamarindus occidentalis.........	Linn. Goertn.	Leguminosæ.	Tamarind..... ....*Eng.* Poolie.......................... *Tam.* Balam Poolie..... .... *Mal.* Umbli........ ....*Hind.*	1·264	79	3,145	20,623	864	·0127

121. *Characteristics and uses.*—The tree is valued more for its fruit, than its timber; it is planted in topes or gardens; the trunk is generally from 15 to 20 feet up to the branches, and from 6 to 7 feet in girt; in some old trees it is much gnarled and hollow; the leaves are abruptly pinnate, leaflets numerous; flowers yellow, streaked with red, in racemes, in May, and June; legumes, linear, more or less curved; it is a splendid looking tree, when in blossom, affording a dark, but not a cooling shade, on which account it is not much courted by Hindoos. The heart wood is of small diameter, very hard, close-grained, and sometimes beautifully-veined, of a dark-reddish color, hard to be worked; the sapwood is of a dirty white color, not durable, and if not seasoned in water gets worm-eaten. A cubic foot of unseasoned wood weighs from 92 to 98 lbs. *Uses.*—This is an excellent wood for turnery purposes, used for rice pestles, oil presses, and sugar crushers; carpenters prefer their mallets and planes of this wood on account of its hardness and durability, it is supposed to be the best fuel for brick kilns, as it burns while green. It is a saying of the natives, that it takes fifty years before the heart is formed in the tree; the pulp of the fruit is used for food and medicine; the seeds are boiled into paste, and used by moochies.

122	Tectona grandis..	Linn.	Verbenaceæ	Teak, Moulmein...... ...... do. Thaikoo........ .... *Tam.* Theka............................ *Mal.* Teka.................... ..... *Tel.* Segoon....................... *Beng.* Ky-won........................*Burm.*	686	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

122. *Characteristics and uses.*—This is the staple timber of India and Burmah, and the most useful and durable timber known, soon seasoning, and easily worked: it grows to a lofty size in the forests; leaves opposite, oval, scabrous above, downy beneath; flowers small, white, in June and July; ovary round, hairy. The Malabar teak is superior to that of Burmah in strength and durability, it also contains an oily secretion, which is not found in the Burman wood. Good Teak is of a yellowish-white color, with reddish-brown streaks, having close and straight grains. A cubic foot of unseasoned wood weighs from 55 to 60 lbs. *Uses.*—This wood is extensively used in house and ship-building, and furniture.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
123	Terminalia Berryi............. Pentaptera augustifolia....	Wht. Rox.	Combretaceæ.	White murthee...... ....*Eng.* Vella murthee ....*Tam.*	·768	48	3,882	15,864	806	·0103

123. *Characteristics and uses.*—The tree is said to grow to a large size, as to yield logs 30 feet in length, and 4 feet in mean girt; it is said to be common in jungles, on the Western Coast. The wood is coarse-grained, of a whitish-brown color, nearly equal to Teak in strength, but not durable. A cubic foot of unseasoned wood weighs from 60 to 64 lbs. *Uses.*—It is used by the natives for canoes, and house-building.

	Pentaptera bialata...	Rox.	Combretaceæ	Leiun... ...	Burm.	1·064	64	4,773	22,096	1,042	·0083

124. *Characteristics and uses.*—A few specimens of this wood were brought from Burmah, by the late Conductor Bowman, and a log was also sent from the same place for experiment, measuring 16¾ feet in length, and 4½ feet in mean girt. According to Dr. Brandis the tree grows to such a size in the jungles as to have "the trunk 80 feet up to the first branch and girting 12 feet at 6 feet from the ground." The wood is strong, hard and durable, very close and even-grained, and fibrous of a dark reddish-brown color, not easily worked, gives a smooth glossy surface, and it does not split, nor warp; the sapwood is also strong, hard and fibrous but not durable, of a yellowish-brown color. A cubic foot in its unseasoned state weighs from 78 to 80 lbs. *Uses.*—The wood is used by the Burmese for posts, and rafters for houses.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
125	Terminalia cattapa.............. Terminalia molluccana.......... Terminalia myrobalana......... Terminalia catapa.............. Terminalia subcordata......... Juglans at ctapa. .	Linn. Lam. Roth. Rox. Willd. Lour.	Combretaceæ.	Indian almond...................*Eng.* Nat-Vadum........................*Tam.* Vedam...................................*Tel.* Adamarrum........................*Mal.* Badam.................................*Beng.* Bedamia Hindee..................*Duk.* Cottamba............................*Cey.*	·562	32	3,108	7,563	470	·0128

125. *Characteristics and uses.*—This is a beautiful tree, with branches nearly horizontal, arranged in tiers; leaves obovate: with small, purplish green flowers, in axillary racemes; it grows tolerably quick, and is found all over India in gardens, or growing wild in jungles on the Western Coast; it attains from 40 to 50 feet in height, and from 3 to 5 feet in girt; the fruit is a compressed oval drupe, dark red when ripe, sweet but not pleasant, containing a nut, the kernel of which has somewhat the flavor of almonds. The wood is light, and coarse-grained, possessing little strength and of a reddish-brown color, its texture is very like that of Mangoe wood, but darker colored, and of less specific gravity. A cubic foot of unseasoned wood weighs from 40 to 42 lbs. *Uses.*—The wood is used in Ceylon and the Western Coast for common house-building, and also tried for Railway sleepers.

Terminalia myro- balanus citrina	Kœn.	Comb	Haldah.......................Duk. Hara..........................*Hind.* Kyo-zoo.....................*Burm.*

126. *Characteristics and uses.*—The tree grows to a large size in the jungles of India and Burmah, from 40 to 50 feet in height and from 5 to 6 feet in girt; leaves are nearly opposite; shortly petioled, ovate, oblong, obtuse, or cordate at the base, quite entire; when young clothed with glossy silk hairs, parcticularly above; adult ones glabrous, sometimes glaucous; flowers small, whitish, foetid, in terminal spikes; in March and April: drupes, oval, glabrous. The wood is strong, heavy, close-grained and hard, of a dark reddish-brown color, not easily worked. A cubic foot of unseasoned wood weighs from 65 to 68 lbs. *Uses.*—The wood is used in house-building, and cart framing; the sapwood is of a yellowish light-brown color, strong but not durable; the drupes are used in the arts and medicine.

[illegible]

opposite, linear, oblong, somewhat cordate at the base, pubescent, but finally glabrous above, sometimes pubescent beneath; flowers are small, greenish-white, in branched panicles, from April to June; fruit glabrous. The timber is of a reddish-brown color, sometimes streaked with a darker hue, it is heavy, tough and durable, very fibrous and elastic, a superior wood for direct cohesive strength, tolerably close and even-grained. A cubic foot of unseasoned wood weighs from 75 to 80 lbs. *Uses.*—The wood is used in the construction of carts and house-building: previous to 1830, when the Gun Carriage Manufactory was at Seringapatam it was used for Poles, splinter bars, spokes and hand spikes, of Ordnance carriages: the large solid wheels and framing of the Hindoo cars are generally made of this wood.

Pentaptera glabra Pentaptera obovata…	Rox. …D. C.	Combre[illegible]	Tella madoo……… *Tel.* Touk kyan……… *Burm* Carcemaradoo……… *Mal.*	·880	·55	,905	20,0	[illegible]	[illegible]	

128. *Characteristics and uses.*—The tree grows to a large size, nearly equal to the Teak, and is said to be found in all the Teak forests of India and Burmah; the leaves are nearly opposite, narrow oblong, obtuse, or acute at the apex, glabrous on both sides, often reddish beneath; flowers rosy red, interminal spikes, in April and May; drupes ovate, with 5 to 7 equal longitudinal wings. The wood is heavy, strong, tolerably close and even-grained, and durable, of a dark-brown color. A cubic foot of unseasoned wood weighs from 70 to 73 lbs. *Uses.*—The wood is used in house-building, framing of carts and furniture.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
129	Terminalia species...............	...	Combretaceæ.	Pangah........................*Burm.* Kucha.............................. *Tal.* Moundăh : .... *Kar.*	·960	60	3,983	13,263	1,032	·0108

129. *Characteristics and uses.*—The tree is said to abound in the Tenasserim Provinces, logs from 20 to 30 feet in length, and from 3 to 6 feet in girt, are said to be procurable, it produces a strong and elastic timber, coarse grained and compact, not easily worked, of a dirty white color, striped with a darker hue at its junction with the alburnum, or sap wood. A cubic foot of unseasoned wood weighs from 73 to 76 lbs. *Uses.*—The wood is used by the Burmese for carts and house-building. This wood is called by Captain Benson, Pangah in Burmese, Dr. McClelland designates Pangah as Terminalia Bellerica, and Dr. Brandis as Terminalia chebula.

	Hibiscus populneus	Linn.	Malvaceæ	[illegible] Tel. Poresh Beng. Parsippu Hin. Parish Duk. Shouaddo Burm.	·784	49	3,294	18,243	716	·0121
	Malvaviscus populneus	Gœrtn.								

130. *Characteristics and uses.*—For the rapid growth and handsome appearance of this tree, it is planted for road-side avenues; leaves cordate of a dark green color; flowers large, sulphur yellow, with a dark blood colored eye; capsules containing two or three downy seeds, and a quantity of yellow pigment. The tree is easily propagated, either by cuttings or seed, the seedling plant yields a sound trunk and good timber, in the other the trunk runs hollow and gnarled, and the timber only fit for fuel. It grows to a large size, especially in the southern parts from 4 to 6 feet in girt, and from 12 to 15 feet up to the branches. The wood is strong, straight and even-grained, of a pale-red color fading to reddish brown, easily worked. A cubic foot of unseasoned wood weighs from 59 to 62 lbs. *Uses.*—The wood is preferred by the natives for gun stocks; used for furniture and cart framing; the yellow pigment, from the capsules, is used as an external application for ring-worms.

height, and from 3 to 6 feet in girt; according to Mr. Abrew "it produces an oil yielding fruit," the wood is strong, stiff and compact, close, even and straight grained, of a yellowish white color, a good wood for transverse strain and direct cohesive power. Specimens of this wood were sent by Captain Benson from the Tenasserim Provinces; a cubic foot of unseasoned wood weighs from 70 to 73 lbs. *Uses.*—This wood is well suited for articles of turnery, and handles of instruments and tools.

[illegible]	[illegible]	[illegible]	[illegible]	Synonyms	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
132	Vatica robusta....	Wilt.	Dipterocarpeæ	Sal.... Beng. Sal.... Hin. Googilam.... Tel. Eengyeen.... Burm.	·880	55	4,209	18,243	880	·0094
	Shorea robusta...	Rox.								

132. *Characteristics and uses.*—This tree affords the best and most extensively used timber in the Northern Provinces of India; it grows to a lofty height from 100 to 150 feet, and from 5 to 8 feet in girt; the leaves are entire ovate oblong; flowers middle sized, yellowish-white, fragrant, in April and May; it yields a great quantity of resin, called ral or dhoona. It is abundant in the forest of Northern India, Arracan and Burmah. The wood is strong and tough, coarse-grained and fibrous, not easily worked, and when dressed has a hard, horny surface, and the fibres appear to be interlaced with each other. Although it is superior to Teak in transverse strength and direct cohesive power, it is not so durable, it takes a long time to season, and subject to great shrinkage, and will warp and crack. A cubic foot of unseasoned wood weighs from 68 to 72 lbs. *Uses.*—It is used in the Northern Provinces of India, and other places where it abounds, for house-building and other purposes; it is also used in Madras and Bengal in the construction of Gun Carriages.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
133	Vatica thumbugaia..................... Shorea thumbugaia............	Wht. Rox.	Dipterocarpaceæ.	Thumbagum.................. *Eng.* Thumbogum........................ *Tam.* Vanboga.............................. *Mal.*	·929	58	4,296	16,420	980	·0093

133. *Characteristics and uses.*—This tree yields one of the strongest woods for transverse strength, it grows to a large size in the Travancore forests upwards of 60 feet in height, and from 6 to 8 feet in girt; the leaves are ovate cordate; flowers yellow in March and April. The wood is strong, hard and tough, in color and texture like Saul, but more compact, it is said to be the same as the African teak. A cubic foot of unseasoned wood weighs from 70 to 77 lbs. *Uses.*—It is used for house-building; and it is a good wood for sheave blocks, and for all other purposes where hardness and strength only is necessary, and weight is of no consideration, which is the only objection against its use in the construction of Ordnance Carriages.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
134	Wrightia antidysenterica.... ... Nerium antidysenterica.... ...	R. Br. Linn.	Apocynaceæ.	Veppalay...... .... *Tam.* Lathow...................... *Burm.*	·608	38	2,321	14,164	562	·0172

134. *Characteristics and uses*—The tree grows to a moderate size from 15 to 20 feet in height, and from 2 to 3 feet in girt; leaves opposite, obovate, oblong, short accuminated; flowers white, fragrant. The wood is light, very close, straight and even-grained of a white color, tough, but easily worked, gives a smooth surface, and stands a good polish; it warps if it is not properly seasoned, but it never splits. A cubic foot of unseasoned wood weighs from 45 to 48 lbs. *Uses.*—The wood is used for inlaying of furniture and toys.

[illegible]

in gardens on account of its fruit, which has a sub-acid flavour, like that of a fresh apple; the fruit is oblong, or roundish, of the size of a pigeon's egg, and often larger; the tree grows from 20 to 30 feet in height, armed with short stipulary prickles, the trunk is from 10 to 12 feet up to the branches, with a girt from 3 to 4 feet; leaves are elliptical or oblong, sometimes coarsely toothed at the apex, serrulated, acutish, or obtuse or slightly cordate at the base, upper side glabrous, underside as well as young branches and petioles covered with dense, tawny tomentose flowers, greenish-yellow, in sessile cymes, or very shortly peduncled in August and September. The wood is close and even-grained, hard and durable, when fresh cut it is of a yellowish red color, and turns to reddish brown. A cubic foot of unseasoned wood weighs from 72 to 75 lbs. *Uses.*—The wood is used by the natives for a variety of purposes, it is well adapted for cabinet and ornamental work.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
136	*Zizyphus xylopyra*......... *Zizyphus elliptica*.............. *Zizyphus rotundifolia*............. *Zizyphus orbicularis*............ *Rhamnus xylopyrus*...........	Willd. Rox. Roth. Schult. Retz.	Rhamnaceæ.	Gothee........................ *Tam.* Gottee...... .. .. *Tel.* Gottee........ .... *Mal.* Goomu........................ *Can.*	·960	60	4,191	17,450	800	·0095

136. *Characteristics and uses.*—The tree grows to a middling size, from 15 to 20 feet in height, armed with stipulary prickles, and from 2 to 3 feet in girt; said to be abundant in the forests of Central and Southern India; leaves alternate broadly elliptical, underside pale, softly pubescent when young; flowers greenish-yellow in short cymes; drupe turbinate. The wood is of a brownish yellow color, closed but not even-grained, it is strong, compact and durable, easily worked. A cubic foot of unseasoned wood weighs from 75 to 78 lbs. *Uses.*—The wood is used by the natives in the construction of carts and implements of husbandry; the drupes are used by shoe-makers to blacken leather and to make blacking.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
137	Unknown...	...	...	Congoe.......................... *Eng.* Congoe... ....*Mal.*	1·024	64	4,296	20,623	892	·0093

137. *Characteristics and uses.*—This wood is used by Government for fuzes; it was received into the Manufactory in scantlings about 10 feet in length 4½ × 2 inches; the wood appears to be identical with that of Cynometra ramiflora, only that it is heavier, in other respects it possesses the same characteristics.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^2 p}$
138	Unknown.........	...		Crangee.......................*May*.	1·248	78	6,220	...	1,771	·0064

138. *Characteristics and uses.*—This is a very strong, stiff wood, hard, close grained and durable, of a light-brown color, not easily worked, splits when exposed. It was received from Singapore, and the late Captain Best, of the Madras Engineers, stated in his report "that the Chinese use it for stern posts for their junks, and for anchors."

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L p}$
139	Unknown...... ...	...	...	Daroo........................ } Dagoo...................... } May. Dawoo...................... }	·928	58	5,190	...	1,079	·0077

139. *Characteristics and uses.*—This wood is also from Singapore; in color and texture it appears to be identical with Thumbagum (Vatica thumbugaia), and according to the late Captain Best, "the tree grows to a large size, and it is used for beams in houses, and piles.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
140	Unknown..........	...	...	Dungum...................... *May.*	·816	51	3,890	...	721	·0102

140. *Characteristics and uses.*—This wood was received from the Island of Labuan, it is of a yellowish light-brown color, tough, and tolerably close-grained, easily worked and not liable to split.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
141	Unknown… ……	•••		Luhu…………………………*May.*	·704	44	3,114	…	721	·0128

141. *Characteristics and uses.*—This wood was also received from the Island of Labuan, it is of a yellowish-brown color, with a coarse and glossy grain, easily worked, and subject to worms.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
142	Unknown..........	...	...	Maraboo........................*May*.	·928	58	4,448	26,175	1,079	·0089

142. *Characteristics and uses.*—This wood from its texture appears to be a species of Acacia, it was sent with the other specimens from Singapore: it is hard, stiff and durable, tolerably close grained, of a reddish-brown color, not liable to split nor warp, easily worked, and stands a good polish. Used by the Chinese for house and ship building, and furniture.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
143	Unknown...	...	...	Medang.............. ....*May.*	·896	56	2,595	...	464	·0154

143. *Characteristics and uses.*—The wood is of a yellowish-brown color, coarse grained, and brittle, possessing a strong fragrant smell, somewhat like that of Camphor wood: it was received with the other specimens from Singapore, and it is said to be used by the Chinese for boxes.

Experiments on the Elasticity, direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
142	Unknown..........	...	...	Maraboo....................... *May.*	·928	58	4,448	26,175	1,079	·0089

142. *Characteristics and uses.*—This wood from its texture appears to be a species of Acacia, it was sent with the other specimens from Singapore: it is hard, stiff and durable, tolerably close grained, of a reddish-brown color, not liable to split nor warp, easily worked, and stands a good polish. Used by the Chinese for house and ship building, and furniture.

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144	Unknown..........	...	...	Meerawan.......... } *May.* Meeraban.......... }	·864	54	4,487	...	977	·0088

144. *Characteristics and uses.*—This is also a Singapore wood, it is of a reddish-brown color, hard and durable, close and even grained, easily worked, but liable to split when exposed. It is well suited for cabinet work, and the Chinese use it for ship-building and furniture.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{LW}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^2 p}$
145	Unknown… ……	…	…	Myrole…… ……………………*May.* Mirule………………………*Tam.*	1·008	63	3,190	12,322	557	·0125

145. *Characteristics and uses.*—A log of this wood was sent to the Gun Carriage Manufactory, from the Canara jungles, it is weak and flexible with a coarse hard grain, and of a light-brown color, it does not split, nor warp, and said to be durable. The wood is used by the natives in the construction of carts.

Experiments on the Elasticity direct Cohesion, and comparative Strength of some of the Indian and Burman Timbers.

Number.	Genera.	Authority.	Order.	Synonyms.	Specific gravity.	Weight in lbs. of a cubic foot of seasoned wood.	The measure of elasticity. $E = \frac{L^3 p}{b d^3 \delta}$	The value of C or direct cohesion on a square inch in lbs.	Co-efficient for comparative strength. $P = \frac{L W}{b d^2}$	Co-efficient for comparative stiffness. $S = \frac{40 b d^3 \delta}{L^3 p}$
146	Unknown..........	...	...	Rungas..........................*May.*	·624	39	3,580	...	682	·0111

146. *Characteristics and uses.*—The tree is said to be abundant in Penang, and the Eastern Islands, growing 30 feet in height and 1½ feet in girt; the wood is light and tough, close and even-grained, of a deep reddish-brown color, it is easily worked, and gives a good polish, it does not split, nor warp. It is used by the Chinese for furniture work.

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